DOCUMENT RESUME

ED 050 529 EC 032 372

AUTHOR	Fredericks, H. D. Bud
TITLE	A Comparison of the Doman-Delacato Method and Behavior Modification Method Upon the Coordination of Mongoloids.
INSTITUTION	Oregon State System of Higher Education, Monmouth. Teaching Research Div.
SPONS AGENCY	Vocational Rehabilitation Administration (DHEW), Washington, D.C.
PUB DATE	Jan 69
NOTE	169p.
EDRS PRICE	EDRS Price MF-$0.65 HC-$6.58
DESCRIPTORS	Behavior Change, *Exceptional Child Research, Mentally Handicapped, *Mongolism, *Perceptual Motor Coordination, Psychomotor Skills, *Social Reinforcement
IDENTIFIERS	*Doman Delacato Method

ABSTRACT

In order to examine the effects of two treatment methods on the coordination of mongoloid children, 72 mongoloid children (ages 7 to 12) were randomly assigned to groups receiving either the Doman Delacato method or behavior modification procedures utilizing social reinforcement. The children were pre and posttested by the Doman Delacato Profile and a modified version of the Lincoln-Oseretsky Motor Development Scale. At the end of the 9-week treatment, results showed no significant differences between the two treatment methods although the children receiving the behavior modification treatment demonstrated at the conclusion of the study more improved coordination than did the children receiving the Doman Delacato method. Implications and recommendations for further study were outlined. (RD)

A Comparison of the Doman-Delacato Method and Behavior Modification Method Upon the Coordination of Mongoloids

by H. D. Bud Fredericks

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TEACHING RESEARCH
a Division of the Oregon State System of Higher Education

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Project No: RD-2753-P-68

January, 1969

Teaching Research

A Division of the Oregon State System of
Higher Education
Monmouth, Oregon

This investigation was supported, in part, by Research Grant No. RD-2753-P-68 from the Vocational Rehabilitation Administration, Department of Health, Education and Welfare, Washington, D. C. 20201

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ACKNOWLEDGEMENTS

The writer wishes to express his appreciation to Dr. James M. Pomeroy, Superintendent of Fairview Hospital and Training Center, for his active support of the project described in this report and to Dr. Victor Baldwin for his assistance in arranging the administrative details which made this project possible.

The writer is especially grateful to Dr. John deJung for his guidance, encouragement and criticism.

The critical evaluation of the project by Dr. Edna Wooten, Dr. Knute Espeseth and Dr. James Crosson is much appreciated.

Special gratitude is voiced to Dr. James Beaird, Associate Director of Teaching Research, who supported and encouraged the accomplishment of this research; to Mr. James Walter and Mr. Philip Doughty, for their assistance in the conduct of this project; to 80 Oregon College of Education students, without whose assistance, help, and enthusiasm this study could not have been accomplished; to Mrs. Carole Krasch, Executive Director of the Institutes for the Achievement of Human Potential, and the Board of Directors of the Institutes, for their cooperation and assistance in the conduct of this project.

A very special thanks goes to my wife without whose encouragement this project would never have been accomplished and to my four older children who were understanding throughout, and finally to Timmy, who served as the initial inspiration for this study.

H.D.F.

TABLE OF CONTENTS

List of Tables iii

List of Figures vi

Chapter

Page

I. Statement of the Problem 1

II. Review of the Literature 8

III. Research Methodology 16

IV. Findings 58

V. Summary and Implications 95

Appendices

A. Student Record Folder Information 103

B. Written memorandum to students re Mazes activity 112

C. Written memorandum to students re Pencils activity 113

D. Teaching Research Modification of the Lincoln-Oseretsky Motor Development Scale for Trainable Retarded 115

E. Scores achieved on modified Lincoln-Oseretsky Motor Development scale by Groups A (Doman-Delacato), B (Behavior Modification), and C (Control) on pretests, periodic two week tests and posttests 146

F. Post scores and means achieved on modified Lincoln-Oseretsky Motor Development Scale by all groups. 147

G. Results of follow-up testing on the modified Lincoln-Oseretsky Motor Development Scale. 148

H. Post gross and fine motor coordination scores achieved on the modified Lincoln-Oseretsky Motor Development Scale . . . 149

CONTINUED

Appendices

Page

I. Scores achieved on Doman-Delacato Profile by groups A (Doman-Delacato), B (Behavior Modification), and C (Control) on pretests, periodic two week tests, and posttests. 150

J. Post scores and means achieved on Doman-Delacato Profile by all groups. 151

K. Results of follow-up testing on the Doman-Delacato Profile . 152

Bibliography 153

LIST OF TABLES

Table Page

I. Information about subjects assigned to Group A 21

II. Information about subjects assigned to Group B 22

III. Information about subjects assigned to Group C 23

IV. Information about subjects assigned to Group D 24

V. Information about subjects assigned to Group E 25

VI. Information about subjects assigned to Group F 26

VII. Grouped pretest scores of groups A (Doman-Delacato), B (Behavior Modification), and C (Control) on the modified Lincoln-Oseretsky Motor Development Scale 60

VIII. Results of t tests of mean differences of pre-scores of groups A (Doman-Delacato), B (Behavior Modification), and C (Control) on the modified Lincoln-Oseretsky Motor Development Scale 61

IX. Grouped post scores achieved on the modified Lincoln-Oseretsky Motor Development Scale 62

X. Results of t tests of mean differences in post scores on the modified Lincoln-Oseretsky Motor Development Scale between periodically tested groups and posttested only groups 63

XI. Results of t tests of mean differences in post scores on the modified Lincoln-Oseretsky Motor Development Scale among the Doman-Delacato treatment groups, the behavior modification treatment groups and the control groups 65

XII. Results of matched t tests of mean differences between post test scores and follow-up test scores on the modified Lincoln-Oseretsky Motor Development Scale 67

XIII. Results of the follow-up tests compared with the posttests on the modified Lincoln-Oseretsky Motor Development Scale . . . 68

CONTINUED

Table Page

XIV. Results of t-tests of mean differences of follow-up scores on the modified Lincoln-Oseretsky Motor Development Scale among the Doman-Delacato treatment groups (A/D), the Behavior Modification treatment groups (B/E), and the Control groups (C/F). 69

XV. Results of t-tests of mean differences in post scores of gross and fine motor coordination on the modified Lincoln-Oseretsky Motor Development Scale among the Doman-Delacato treatment groups (A/D), the Behavior Modification treatment groups (B/E), and the Control groups (C/F). 71

XVI. Results of t-tests of mean differences in post scores with all zero scores removed on the modified Lincoln-Oseretsky Motor Development Scale among the Doman-Delacato treatment groups (A/D), the Behavior Modification treatment groups (B/E), and the Control groups (C/B) 73

XVII. Trend analysis results of repeated tests of groups A (Doman-Delacato), B (behavior modification), and C (control) on the modified Lincoln-Oseretsky Motor Development Scale . 75

XVIII. Average gains in scores between pretest and posttest on the modified Lincoln-Oseretsky Motor Development Scale of children in groups A, B, and C, dichotomized by those receiving more or less than 10 on the pretest 77

XIX. Results of t-tests of mean differences of pre-scores of groups A (Doman-Delacato), B (behavior modification), and C (control) on the Doman-Delacato Profile 80

XX. Results of t-tests of mean differences in post scores on the Doman-Delacato Profile between periodically tested groups and posttested only groups 81

XXI. Results of t-tests of mean differences in post scores on the Doman-Delacato Profile among the Doman-Delacato treatment groups (A/D), the behavior modification treatment groups (B/E), and the control groups (C/F). 83

XXII. Results of the follow-up tests compared with the posttests on the Doman-Delacato Profile 85

CONTINUED

Table Page

XXIII. Results of t-tests of mean differences of follow-up scores on the Doman-Delacato treatment groups (A/D), the behavior modification treatment groups (B/E) and the control groups (C/F). 86

XXIV. Trend analysis results of repeated tests of groups A (Doman-Delacato), B (behavior modification), and C (control) on the Doman-Delacato Profile 87

LIST OF FIGURES

Figure Page

1. String Winding Equipment 33

2. Pegs and Holes Equipment 36

3. Discs Equipment 38

4. Mazes 43

5. Pencils 44

6. Diagram of Treatment Center 50

7. Profile of mean scores achieved by groups A (Doman-Delacato), B (behavior modification), and C (control) on the modified Lincoln-Oseretsky Motor Development Scale . . . 76

8. Gain scores of groups A (Doman-Delacato), B (behavior modification), and C (control) on the modified Lincoln-Oseretsky Motor Development Scale 78

9. Profile of mean scores achieved by groups A (Doman-Delacato), B (behavior modification), and C (control) on the Doman-Delacato Profile 89

10. Gain scores of groups A (Doman-Delacato), B (behavior modification), and C (control) on the Doman-Delacato Profile 90

SIGNIFICANT FINDINGS FOR THE REHABILITATION WORKER

This study examined over a nine week period the effects of two treatment methods on coordination of mongoloid children under the assumption that improved coordination during childhood will improve their coordination as an adult and thus improve their vocational potential. One of the treatments was the Doman-Delacato method; the other treatment used behavior modification procedures.

There were no significant differences between the results of the two treatment methods although the children receiving the behavior modification treatment method demonstrated at the conclusion of the study more improved coordination than did the children receiving the Doman-Delacato method.

There were no significant differences between the results achieved by the children receiving the Doman-Delacato treatment method and the results achieved by the control group although those receiving the Doman-Delacato treatment method did demonstrate more improved coordination than did the control group. The attainment of these higher scores in coordination may be an indication that if the time of the study had been extended for a longer period the Doman-Delacato treatment groups might have achieved some significant improvements. The shape of the learning curve during the nine week period indicates that this is a possibility.

Significant improvements both in gross and fine motor coordination were achieved by the children receiving the behavior modification treatment method as compared to the control group. Although the time allotted to treatment was short, only nine weeks and only 20 minutes a day, we can conclude that behavior modification methods have merit as a technique of improving motor coordination. It should be noted, moreover, that the learning curve was on an upward trend at the conclusion of the study.

It is significant that the gains made by the children receiving the behavior modification treatment method were retained after a three month period during which no treatments were administered. This seems to indicate that the gains made were stable.

Two evaluation instruments were used - the Doman-Delacato Profile and the Lincoln-Oseretsky Motor Development Scale. During the pilot work with the Lincoln-Oseretsky Motor Development Scale, it was determined that certain modifications of the scale were necessary to allow the level of the test to be lowered so that the more severely retarded children could achieve a score. The modification of the scale is included in this report and is believed to be a suitable instrument for those needing a scale to measure motor abilities of moderately and severely retarded children.

Further research is needed to determine:

1. Whether the Doman-Delacato method can improve coordination if applied over longer periods of time.

2. Whether the Behavior Modification methods can further improve coordination if applied over longer periods of time and whether its improvement would be more dramatic if other types of reinforcement were utilized.

3. Some of the more severely retarded children did not demonstrate improved motor coordination although there were indications that changes were occurring. The question remains that if the study had run for a longer period, would these children also have achieved significant improvement.

4. Although this study presents a systematic program of the utilization of behavior modification, it was initiated only as a "contrast" curriculum. Therefore, there is need for a more extensive effort at curriculum development for the physical improvement of the severely retarded. Such an effort might well be expected to yield substantially more efficient motor coordination training procedures.

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CHAPTER I

STATEMENT OF THE PROBLEM

From 10 to 20 percent of moderately and severely retarded children have Down's Syndrome (Mongolism). This is a genetic disorder, usually not inherited, in which there is an error in cell division.

Our knowledge about individuals with Down's Syndrome (Mongoloids) indicates that their expected mental development will allow no more advanced economic endeavor than employment in a sheltered workshop. And yet, a study by Benda (1960) of the Down's Syndrome population indicates the following:

> Great accuracy of motor control is rarely achieved, and even those with higher mental ages have imperfect motor control... Most Mongoloids are unable to help in any trade requiring skilled motor control. This limits their usefulness...

This finding is supported by other researchers. Fisher and others (1964) reported that the motor development in children with Down's Syndrome was found to be relatively normal up to age six months, followed by a gradual decline in rate of development. Sternlicht (1966) supports the fact that motor development is usually quite substandard. Thompson (1963) in an examination of pre-school Mongoloid children found that among five and six year olds, eye and hand coordination was quite poor and that many of the childrens' hand movements were unsteady. Girardeau (1959) reports that sheltered workshop personnel who have worked with adult mongoloid individuals comment on the difficulty which the mongoloids have in synchronizing the movements of both hands. Cantor (1951) reports that he found that those with IQ's below 60 had a marked inability to perform tasks involving manual dexterity.

Therefore, the adult Mongoloid, who is unable to perform normal economic activity because of his state of retardation, is also often prevented from even limited economic usefulness in the majority of sheltered workshop activities because of poor motor coordination.

Employment of mongoloids has not been of major concern in years past because of their relatively high mortality rate during infancy and early childhood. It has been well established that 75% of the mongoloids are born with congenital heart defects. In addition, pneumonitis is quite common and pneumonia as a chronic condition often develops. In previous decades, mongoloids have shown a great susceptibility to tuberculosis. (Benda, 1960). Oster (1964) maintains that in addition to diseases of respiratory organs and cardiac diseases, leukemia is a major cause of death.

Each of these diseases has in the past extracted a high toll among the Down's Syndrome population. However, with improved medical attention the span of life of mongoloids has been increased. Many of them will live to advanced age. Forssman and Akesson (1965) cite evidence over a ten year period that the mongoloid mortality rate is being reduced. Of a sample of 1262 patients, they found a mortality rate only 6% above national average. Levinson and Bigler (1960) cite the use of antibiotics and improved medical care as the main reason for the longer life expectancy of the Down's Syndrome population.

The greater number of patients with Down's Syndrome is an incipient social problem for the community. Mental institutions and hospitals are crowded and are often forced to admit patients on a strict priority basis. Mongoloids who can reside at home, and whose family desires to keep them at home, should probably not be institutionalized, providing there are adequate community facilities where they may be employed.

Kirman (1965) emphasizes the social problem which this increased survival rate is causing. He believes that communities should provide adequate assistance for these patients and for their families. Clarke and Hermelin (1955) recommend not committing mentally retarded of the caliber of those with Down's Syndrome to mental institutions but maintain that they can be trained to work profitably not only in a sheltered workshop but also in limited outside employment conditions. Robinson and Robinson (1965) emphasize the desirability of keeping the trainable retardate out of an institution and providing community services for him. Kirk (1962) also stresses the need for sheltered workshops as opposed to institutionalizing the trainable mentally retarded. Lecuyer (1965) maintains that whenever possible mongoloids should either live at home or maintain contact with their families. He believes that it is essential that mongoloids be regularly occupied and believes that supervised workshops provide the best solution for these occupational problems.

Measures to secure adequate workshop facilities have already been taken. The Vocational Rehabilitation Act Amendments of 1965 authorized a comprehensive program of federal financial assistance for state planning of rehabilitation facilities and workshops, for the construction of new sheltered workshops, and for the improvement of existing workshops. Special provisions are made for the mentally retarded to permit the inclusion of residential facilities. (Mental Retardation Activities, 1967).

Thus a program is underway to provide the necessary workshops with provisions for non-transient mentally retarded clients. The problem is to prepare the mentally retarded, and specifically adult mongoloids, to function effectively in a sheltered workshop. Effective functioning means being able to perform some of the work activities contracted for by the workshop. These may include sawing, nailing, building wood boxes, welding and repairing of metal objects, soldering of electrical units, working in a gas station, repairing and cleaning of furniture, weaving, and sewing.

The question arises whether limited intelligence and poor coordination will prevent mongoloids from performing effectively in a sheltered workshop. If so, their employability, even by the workshop, will be restricted, since most workshops must necessarily limit the number of work stations for permanent clients who are unable to produce sufficient work to support the operation of the workshop.

There is some evidence that mongoloids can reach a suitable level of skill. Tizard and Loos (1954) and Clarke and Hermelin (1955) report the success of six patients who were able, after two years of training, to solder four different colored wires to an eight pin television plug.

Clarke and Hermelin report that the learning of this skill is very difficult and may well be near the limits of what can be learned by these types of retardates. Tobias and Cortazzo (1963) describe a two year training program in a sheltered workshop for trainable retardates, and although some success was achieved in their work functioning, it was concluded that more than two years of training was needed. Crosson (1966) in an exploratory study demonstrated that principles of operant conditioning can be employed in a rather straight forward manner with severely retarded adults in the development of highly efficient programs of training for specific vocational skills.

Part of the difficulty which mongoloids have with learning such skills as soldering is a function of their poor coordination. Consequently, if coordination can be improved, perhaps this skill can be learned easier and perhaps more people in this mental range can accomplish the task.

There are no proven ways to teach coordination. However, literature already cited (Crosson, 1966) indicates that operant conditioning techniques, which hereafter will be referred to as behavior modification, may provide possible improvement. In addition, the techniques developed by the Institutes for the Achievement of Human Potential, commonly referred to and hereafter referred to as the Doman-Delacato method, must be considered as a possible means of improving coordination.

The Doman-Delacato procedure has been reported as being applied to two populations, brain damaged children and children with reading problems. These children are reported to have improved in motor movement and coordination and to have demonstrated in many cases a significant advancement in mental functioning. (Delacato, 1963 & 1966; Doman, 1960 and undated).

The procedure has not as yet been reported as being applied to mongoloids. If the success which Doman and Delacato report for the general development of brain damaged children were to apply to the coordination problems of mongoloids, there would be considerable help for the mongoloid population in that one could anticipate that motor coordination would not then hinder their learning of manual skills appropriate for workshop labor.

This study will examine the two techniques, the Doman-Delacato method and behavior modification, to determine if either or both can improve coordination ability of mongoloids.

More specifically, mongoloid children, ages 7 to 12, patients at Fairview Hospital and Training Center, Salem, Oregon will be divided into three groups by random assignments within sex and age groupings.

The first group will be administered Doman-Delacato patterning treatment four times a day, fifteen minutes at a time for a period of nine weeks. They will be encouraged to do extensive crawling and to utilize a crawl box. The second group, for the same period of time, will be administered a behavior modification treatment in which they will be required to perform various motor activities which will utilize principles of shaping, reverse chaining, and social reinforcement. The final group will be a control group. Half of the subjects in each group will receive pretests, bi-weekly tests, and posttests. The remaining subjects in each group will receive only the posttest.

Two evaluation scales will be utilized, the Doman-Delacato Profile and the modified Lincoln-Oseretsky Motor Development Scale.

The null hypotheses to be tested are:

> There are no differences in mean motor coordination scores for subjects receiving either the Doman-Delacato method of treatment, the behavior modification method of treatment, or no treatment.
>
> There are no differences in mean motor coordination posttest scores for subjects periodically tested and subjects tested at the conclusion of the treatment.
>
> There are no differences between mean motor coordination posttest scores and mean motor coordination follow-up scores for subjects receiving either the Doman-Delacato method of treatment, the behavior modification method of treatment, or no treatment.
>
> There are no differences in mean fine motor coordination scores for subjects receiving either the Doman-Delacato method of treatment, the behavior modification method of treatment, or no treatment.
>
> There are no differences in mean gross motor coordination scores for subjects receiving either the Doman-Delacato method of treatment, the behavior modification method of treatment, or no treatment.
>
> There are no differences in treatment trends for subjects receiving either the Doman-Delacato method of treatment, the behavior modification method of treatment, or no treatment.

CHAPTER II

REVIEW OF THE LITERATURE

The review of the literature is divided into four parts (1) the Doman-Delacato Theory; (2) evaluation instruments, namely, the Doman-Delacato Profile and the Lincoln-Oseretsky Motor Development Scale as an evaluation instrument for the motor development of moderately retarded children; (3) behavior modification techniques as they apply to coordination; and (4) programs for the development of motor abilities in retarded children.

Doman-Delacato Theory.

The Doman-Delacato theory has been published in a series of pamphlets and books (Delacato, 1959; 1963; 1966), (Doman, undated and 1960), (Lewinn, 1966, and others 1966). For the purposes of explanation the theory can be divided into seven basic tenets: (1) "the basic difference between the nervous system of a man and that of slightly lower forms of mammals lies not in the number of cells, but in the differentiation and organization of those cells. Thus, we have for man the concept of neurological organization in addition to neurological development." (Delacato, 1966). (2) Man's ontogenetic development proceeds via four distinct phases - medulla and spinal cord, pons, midbrain, and cortex - and it culminates in cerebral hemispheric dominance. According to the Delacato rationale (Delacato, 1963), the phases of man's development recapitulated phylogenic development of the species via fish, amphibians, reptile, and primate. (3) Neurological organization "...provides the organism with all the capabilities necessary to relate it successfully to its environment", (Lewinn and others, 1966) and, as a measure of ontogenetic progress, it is an indicator of man's development, both motor and sensory, (Delacato, 1963). (4) Neurological organization is measured along a continuum, beginning with neurologically disorganized individuals who suffer from frank brain abnormality, continuing through average or above average children with reading problems associated with poor neurological organization, and culminating in physically and intellectually superior individuals with complete neurological organization, (Lewinn and others, 1966). (5) "Walking, writing, auditory understanding of language, tactical competence, as well as speech and reading are the final human results of neurological organization and hence are clinical indices of the nature and the quality of neurological organization of an individual." (Delacato, 1963). (6) Neurological organization can be evaluated by existing procedures advocated by Doman and Delacato. (7) Simple, non-surgical exercises, actively or passively imposed on the nervous system, lead to improved sensory motor functioning through the enhancement of neurological organization (Delacato, 1963); (Lewinn and others, 1966).

On May 6, 1968, the National Association for Retarded Children published to all of its units a statement relative to the Doman-

Delacato treatment methods. Essentially the statement cited reasons for concern about the Doman-Delacato method of treatment of neurologically handicapped children. The main reasons for concern are objections to promotional methods used; a demanding and inflexible regimen that may lead to neglect of other family members since it is maintained that less than 100% adherence to the regimen is useless; restrictions upon normal activities of children; an invalid testing instrument, The Doman-Delacato Developmental Profile; and undocumented claims for cures in a substantial number of cases. On May 10, 1968, Glenn Doman, Director of the Institutes for the Achievement of Human Potential replied to these charges in a position paper in which he essentially denied the validity of each of the charges.

The Institutes for the Achievement of Human Potential had previously published results of their studies in which they claim significant results. (Delacato, 1959, 1963, 1966). However, these studies have been criticized by Glass (1966), and Robbins and Glass (1968).

A search of the literature reveals only two reported studies (Robbins, 1966, 1967; and Kerschner, 1968) which make an effort to determine the validity of the theory. Robbins found no support for the proposition that this experimental program would enhance reading and lateral development. Robbins maintains that the entire theory is suspect. Kerschner indicates mixed results.

Despite the lack of controlled studies, the theory is a popular one and has gained much popular support, as is evidenced by studies reported in Delacato (1966) and by such popular publications as Beck (1964), Maisel (1964), and Bird (1967).

Evaluation Scales.

The Doman-Delacato Profile is an essential part of the Doman-Delacato system and is reported in the literature previously cited. (Lewinn and others, 1966; Doman, undated and 1960; Lewinn, 1966; Delacato 1959, 1963, and 1966.)

The Lincoln-Oseretsky Motor Development Scale (Sloan, 1955) has been widely accepted as being suitable for use with mental retardates. Stevens and Heber (1964) maintain that "the most widely used standardized battery of tests of motor skills is that of Oseretsky, two American versions of which are the Vineland Adaptation (Cassel, 1949) and the Lincoln-Oseretsky Motor Development Scale (Sloan, 1955)..." (p. 37). Ellis (1963) states that "...the Lincoln-Oseretsky has been widely used as an index for evaluating motor performance of both normal and retarded children... the Lincoln-Oseretsky is the best standardized motor-development scale available..." (p. 618). Thompson (1962), although not specifically referring to a mentally retarded population maintains that the Lincoln-Oseretsky scale should prove "useful in research and in evaluating the motor development of children recovering from orthopedic handicaps or children undergoing special programs of remediation or enrichment in motor skills." (p. 261). Anastasi (1961) believes the scale is useful in testing mental defectives.

Only a few studies have been uncovered by this author which used the 1955 revision of the Lincoln-Oseretsky Motor Development Scale with retarded children. Rabin (1957) utilized the test on 60 boys and girls, ages 10-14 with IQ's from 40 to 69, and found no difficulties in administration. Robert Berk (1957) in administering the test to mildly retarded, normal, and gifted children made some modifications in the test to allow a better basis of comparison. He provided no evidence that the test could not be administered in its present form to a retarded population. Distefano, Ellis, and Sloan (1958) found no difficulty in administration of the test to 76 retardates with MA's of 5.33 to 11.50 and CA's of 9.66 to 32.41. In Malpass's study (1960), there was no mention of difficulties in test administration to 102 subjects with CA's of 8 to 14 and IQ's of 52-80. Kerschner (1968) modified the Lincoln-Oseretsky Motor Development Scale and termed it the Kershner-Dusewicz-Kershner (KDK) Adaptation of the Vineland-Oseretsky Motor Development Tests. The changes he made were as follows: (1) Group administration was done to lessen the children's anxiety; (2) the list of required equipment was altered as necessary; (3) instructions were clarified to counter ambiguity; (4) cut off points were empirically chosen for items yielding a numerical score or score in seconds to make the scale sensitive to the ability levels of the children tested; (5) certain speed items were deleted. Hofmeister (1967) utilized the scale without modification for a group of educable retarded children (IQ - 48 to 83).

Stein (1963) emphasizes that all the reported studies have been descriptive where the status of motor proficiency has been determined; no attempt has been made to see whether the qualities measured by the Oseretsky Test are amenable to appreciable change with practice or how instruction in physical education affects the results.

Behavior Modification as Applied to Coordination.

There are no reported cases uncovered by this author of behavior modification techniques being used in the teaching of coordination. The techniques used in this study were an adaptation of techniques used by Crosson and deJung (1967). These techniques essentially utilized specified behavior topographies as the instructional units; training programs based upon principles of shaping, operant discrimination, and chaining of responses were then developed.

Programs for the Development of Motor Abilities in Retarded Children.

Physical education programs have only recently developed specifically designed for retarded children. Molloy (1963) in her book recommends that all retarded children follow a physical education program and provides a program which is essentially a modification of one which would be suitable for normal children. Cratty (1967) presents appropriate movement activities for neurologically handicapped and mentally retarded children and youth. Emphasis is upon physical education not only as a means of facilitating motor skills and physical fitness, but also as a way of enhancing the learning disorders. Edson (1968) has developed a variety of traditional balance and roll activities organized in progressive sequence for use with special education children. Regan (1966) recommends a program of physical education through a program of sports and social activities. Robins and Robins (1965) use fundamental rhythms with the retarded. The Sisters of Saint Francis Assisi (1962) and Bowers (1968) also present sequential curricula designed for handicapped children. Brockberg (1968) developed a training program in neuromuscular relaxation for educable mentally retarded children. Perhaps the two most well known physical fitness programs for the retarded are those recommended by the American Association for Health, Physical Education and Recreation (1966 and 1968) and the program recommended by Hayden (1964).

There has been relatively little research which reports the effects of instruction and practice upon the improvement of motor ability or physical fitness of the retardate. Howe (1959) provided ten days instruction and practice for both normal and retarded groups in three motor skill tasks. Both groups showed similar improvement. In Oliver's study (1958) which extended for ten weeks, the retardates showed a significant improvement in physical ability and also a significant rise in mental ability. Fenn (1965) initiated a program of treatment based on a developmental concept of visual and motor coordination. The theory used visual and motor development as a progression through levels of awareness of one's own body and surroundings. Nunley (1965) conducted a fifteen month study on eleven trainable retardates whose chronological ages varied from 9 to 14 and whose mental ages varied from 4 to 6. These subjects participated in neuromuscular exercises and at the end of fifteen months demonstrated behavior which was much more quiet, less erratic and more organized. Their endurance and their coordination also improved. Haring and Stables (1966) conducted a study based on Kephart's Closed Cycle Theory, that is, that gross motor activities effect the perceptual processes. The study was designed to determine the effect of gross motor training on visual perception and eye and hand motor coordination. Results of the study showed significant gains in visual perception and eye and hand motor coordination.

CHAPTER III

RESEARCH METHODOLOGY

General Experimental Design - Overview.

The purpose of this study was to examine two treatment methods, the Doman-Delacato method and behavior modification, to determine if either or both can improve motor coordination of mongoloids.

A total population of 72 mongoloids from Fairview Hospital and Training Center, between ages 7 and 12, were used in the study. These children were sorted by age and by sex and then randomly assigned to one of six groups. The groups received the treatment methods as follows:

Group A received the Doman-Delacato method of treatment, was pretested and tested every two weeks during training.

Group B received the behavior modification method of treatment, was pretested and tested every two weeks during training.

Group C received no treatment but was tested in accordance with the same schedules as Groups A and B.

Group D received the Doman-Delacato method of treatment and received no testing until the completion of the training.

Group E received the behavior modification method of treatment and received no testing until the completion of the training.

Group F received no treatment and was tested in accordance with the same schedules as Groups D and E.

All treatment methods were administered by Oregon College of Education students.

All testing was conducted by a psychometrist from Teaching Research Division, Oregon State System of Higher Education and by the Executive Director of the Oregon Institutes for the Achievement of Human Potential.

Hypotheses.

To determine differences among children receiving the two treatments and the control group, the following major null hypothesis was formulated:

> There are no differences in mean motor coordination scores for subjects receiving either the Doman-Delacato method of treatment, the behavior modification method of treatment, or no treatment.

Certain auxiliary or subsidiary hypotheses were also examined:

To determine whether periodic testing has an effect on scores achieved by the children, the following null hypothesis was formulated:

> There are no differences in mean motor coordination posttest scores for subjects periodically tested and subjects tested at the conclusion of the treatment.

To determine whether gains and differences, if any, achieved as a result of the treatment are stable and are maintained for a period after the conclusion of the treatment, the following null hypothesis was formulated:

> There are no differences between mean motor coordination posttest scores and mean motor coordination follow-up scores for subjects receiving either the Doman-Delacato method of treatment, the behavior modification method of treatment, or no treatment.

To determine differences among children receiving the different treatment - no treatment conditions in test scores for gross motor coordination and/or fine motor coordination, the following two null hypotheses were formulated:

> There are no differences in mean fine motor coordination scores for subjects receiving either the Doman-Delacato method of treatment, the behavior modification method of treatment, or no treatment.

> There are no differences in mean gross motor coordination scores for subjects receiving either the Doman-Delacato method of treatment, the behavior modification method of treatment, or no treatment.

To determine differences in rate of progress under the various treatment conditions, the following null hypothesis was formulated:

> There are no differences in treatment trends for subjects receiving the Doman-Delacato method of treatment, the

behavior modification method of treatment, or no treatment.

Population and Samples.

It was desired to have at least ten subjects in each group. In deference to the Doman-Delacato system which is believed more effective if treatment is rendered at an early age, the youngest subjects available were desirable.

A survey of the mongoloid population at Fairview Hospital and Training Center indicated that all mongoloid children below the ages of 7 years old were participating in a preschool program which was of such a nature that it would contaminate the results of this study. Therefore, no children below the ages of 7 were included in this study. It was further determined that there were only 71 mongoloids, age 7-0 through 12-8, who had no known physical disabilities in any of their limbs. It was decided to include all of these in the study. One additional child who would be 13 during the course of the study was included to allow an equal number of children to be assigned to each of the six groups. This child was randomly chosen from those who were 12-9 to 12-11 and then was randomly assigned to a group; he is identified as subject number 1 in group D.

The 72 children were first divided into male and female. All males were sorted by age. Within each age bracket the children were randomly assigned to one of the six groups. At the conclusion of the assignment of all males, the females were sorted by age and assigned randomly to each of the six groups. The distribution of children is as shown on Tables I through VI which includes information about sex, cottage, age at commencement of study, and age at admission into Fairview Hospital and Training Center.

During the course of the study, nine subjects were eliminated from the study for the following reasons:

In Group A subject number 8 was deleted because of excessive absences from treatment. (Any subject who missed more than 25% of the treatment periods was deleted from the study.) Subject number 12 was deleted because she was unavailable for pretesting and for the first two weeks of treatment due to illness.

In Group B subject number 12 was deleted because of excessive absences from treatment.

In Group C subject number 4 was deleted from the study because it was determined that he was participating in the preschool program which had caused the deletion of all the younger mongoloids.

In Group D subject number 10 was deleted because of excessive absences.

In Group E subjects 7 and 11 were deleted because of excessive absences.

In Group F subject number 10 was deleted because of unavailability for testing during the final testing period. Subject number 12, although tested during the final testing period, was not available for the follow-up test because he had died in the interim period.

During the course of the study it was discovered that many of the subjects suffered from severe eyesight deficiency. This condition

Table I

Information about subjects assigned to Group A.

Number	Sex	Cottage	Age at Commencement of Study	Age at Admission into Fairview
1	M	Pierce	10-3	1-10
2	F	Kay	9-0	5-11
3	F	Snell	12-4	2-4
4	M	Pierce	12-6	3-0
5	M	Pierce	11-3	9-10
6	M	Patterson	12-0	10-7
7	F	Kay	10-7	3-1
8*	M	Holman	9-7	1-1
9	M	Martin	7-1	1-3
10	M	Holderness	9-5	2-6
11	M	Holman	10-0	8-8
12*	F	Holman	11-2	2-6

* deleted

Table II

Information about subjects assigned to Group B.

Number	Sex	Cottage	Age at Commencement of Study	Age at Admission into Fairview
1	M	Holman	9-11	0-6
2	M	Martin	10-0	1-3
3	F	Holman	10-7	6-4
4	M	Holman	8-3	5-9
5	F	Patterson	11-4	1-11
6	M	Pierce	11-9	5-1
7	M	Patterson	9-4	2-5
8	F	Kay	10-3	7-9
9	M	Pierce	12-1	5-0
10	M	Pierce	11-1	2-3
11	F	Holman	7-8	5-11
12*	M	Pierce	12-1	2-5

* deleted

Table III

Information about subjects assigned to Group C.

Number	Sex	Cottage	Age at Commencement of Study	Age at Admission into Fairview
1	M	Pierce	10-0	3-0
2	F	Holman	9-1	4-3
3	F	Holman	9-6	2-6
4*	M	Snell	7-9	3-0
5	M	Patterson	12-4	2-1
6	F	Kay	10-10	2-1
7	M	Snell	8-7	1-7
8	M	Pierce	12-2	1-11
9	M	Patterson	11-9	1-11
10	M	Pierce	11-1	2-2
11	F	Kay	11-5	1-9
12	M	Snell	10-3	3-1

* deleted

Table IV

Information about subjects assigned to Group D.

Number	Sex	Cottage	Age at Commencement of Study	Age at Admission into Fairview
1	M	Holderness	12-10	3-2
2	M	Holman	11-5	8-2
3	F	Kay	10-10	2-1
4	M	Holman	9-7	0-11
5	F	Holman	7-4	2-10
6	F	Snell	10-5	1-8
7	F	Holman	10-1	1-9
8	M	Pierce	11-11	4-2
9	M	Holman	8-5	1-6
10*	M	Pierce	12-3	2-7
11	M	Holman	9-1	6-8
12	F	Kay	11-5	1-9

* deleted

Table V

Information about subjects assigned to Group E.

Number	Sex	Cottage	Age at Commencement of Study	Age at Admission into Fairview
1	F	Holman	10-11	4-10
2	F	Holman	11-7	5-6
3	M	Holderness	12-0	1-10
4	M	Pierce	11-3	4-2
5	M	Snell	10-6	1-9
6	M	Holman	9-3	7-3
7*	M	Snell	7-9	5-3
8	F	Kay	9-4	0-9
9	F	Kay	10-2	2-11
10	M	Pierce	12-8	6-1
11*	M	Pierce	9-10	5-5
12	M	Patterson	12-4	3-8

* deleted

Table VI

Information about subjects assigned to Group F

Number	Sex	Cottage	Age at Commencement of Study	Age at Admission into Fairview
1	M	Holderness	9-10	3-9
2	M	Pierce	12-7	3-2
3	M	Pierce	10-6	1-10
4	M	Patterson	12-0	1-10
5	M	Holderness	10-0	2-0
6	M	Holman	8-0	6-6
7	F	Kay	11-3	2-6
8	F	Patterson	11-11	2-5
9	F	Snell	9-8	1-0
10*	M	Lane	12-4	2-8
11	F	Holman	9-3	0-7
12**	M	Snell	10-2	5-7

* deleted

** deceased between posttest and follow-up test.

perhaps should have been noted earlier and considered as cause for deletion of the subject from the study. However, it was decided that in no case was the eyesight so deficient that the subject was unable either to perform the Doman-Delacato patterning exercises, to complete the crawl box routine, or to be unable to respond to the behavior modification treatment.

Doman-Delacato Treatment Method.

Since the procedures in this study were designed only to improve motor coordination, the entire Doman-Delacato treatment was not administered. That which was administered was agreed upon by the Oregon Branch of the Institutes for the Achievement of Human Potential as being the portion of the Doman-Delacato Treatment which was necessary to improve motor coordination. The treatment administered was patterning, crawling, and a crawl box routine.

Patterning was administered by teams of three or five Oregon College of Education students, although three patterners was the usual number. It was agreed, both by the principal investigator and the Executive Director of the Oregon Institutes for the Achievement of Human Potential that, since none of the subjects in this study suffered from a physical handicap in any of their limbs, three patterners would be adequate.

Patterning was conducted four times during either a morning or an afternoon for five minutes each time with at least fifteen minute intervals between each patterning session. Two patterning types were employed, homolateral and cross-patterning.

The determination of which child was to receive which of the two types of patterning was made in the following manner: the Executive Director of the Oregon Institutes for the Achievement of Human Potential in the course of the initial evaluation of those in groups A, B and C indicated which of the children in these groups should receive homolateral patterning and which child should receive cross-patterning. Since the Executive Director of the Oregon Institutes for the Achievement of Human Potential was unaware which children had been assigned to which group, it was necessary for her to make this designation for all of the children in each of these three groups. Of course, only the children who were assigned to group A were patterned.

There was no initial evaluation for the children in group D. Consequently there was no opportunity for the Executive Director of the Oregon Institutes for the Achievement of Human Potential to examine these children prior to treatment to determine which type of patterning they should receive. However, this is not to be construed as an important problem in the study since the principal investigator was schooled in the Doman-Delacato method by the Executive Director of the Oregon Institutes for the Achievement of Human Potential and felt qualified to designate which type of patterning should be administered to each student in group D. This was done by having each child in group D exhibit his crawling and walking behavior prior to the first treatment period. Thus each child who received the Doman-Delacato treatment was designated to either receive homolateral patterning or cross-patterning.

Homolateral patterning was used for children unable to crawl in a cross-patterned manner. This pattern required one adult turning the head while the adult on the side to which the head was turned flexed the arm and leg. The adult on the opposite side extended both limbs. As the head was turned, the flexed limbs extended and the extended limbs flexed.

The cross-patterning type was used for children able to crawl in a cross-patterned manner. This activity pattern required one adult turning the head while the adult on the side towards which the head was turned flexed the arm and extended the leg; the adult on the opposite side extended the arm and flexed the leg. When the head was turned, the position of the limbs was reversed.

The patterners of both groups were careful to ensure that as the limbs moved, they were dragged or rubbed along the table so as to achieve maximum sensory stimulation. This is in accordance with the Doman-Delacato Doctrine.

When not being patterned, the children who were receiving the Doman-Delacato treatment were encouraged to crawl on standard physical education mats which were placed on the floor for that purpose. In addition, the children were required to crawl as many times as possible through a crawl box which was placed in the room for that purpose. An Oregon College of Education student was usually assigned the task of crawl box supervisor and crawling supervisor. It is estimated that on an average day a child might complete the crawl box 10 to 15 times.

The crawl box may be described as follows: it is a box eight feet long open at either end with a height of 1 1/2 feet. It is three feet wide. The bottom and the sides of the box are made of heavy plywood. Along the bottom of the inside of the box a rug has been tacked down to prevent the child from bruising himself on the wood as he crawls through. The top of the box has three plywood braces, one at the center and one at each end, each about 6 inches wide. The intervening spaces are occupied by two trap doors covered with chicken wire which can be lifted to either assist the child through the crawl box or to aid him should he become frightened or unable to continue.

In order to maintain a record during each half day training session of how many treatments each subject had received, a wall chart, listing the subjects and the type of patterning they were to receive, was maintained. This chart was covered with acetate so that an X could be placed next to the subject's name each time he was patterned, thus ensuring that each subject was patterned four times each day.

Behavior Modification.

The subjects in groups B and E received a behavior modification treatment method. Each subject received five minutes of this behavior modification treatment method four times during a half day of instruction. This treatment, like the Doman-Delacato treatment, was spaced, in that at least fifteen minutes intervened between each five minute instructional session. A different behavior modification activity was scheduled for each of the five minute sessions. Each treatment was administered by one Oregon College of Education student.

The behavior modification treatment was built around a series of activities which were analyzed to determine the specific behavioral components of the activity. The behavior modification treatment then was based upon principles of shaping, operant discrimination, and a chaining of responses. In all cases only social reinforcement was utilized; this entailed verbal approval and physical contact. The verbal approval was administered by the Oregon College of Education student saying, "Good", "Very good", "That's a good boy (girl)", or a similar phrase; the physical contact was administered by the student touching, hugging or squeezing the subject.

The treatments were administered in private rooms with only the subject receiving the treatment and the Oregon College of Education student administering the treatment present. Occasionally the principal investigator or his assistant would be present to observe the interaction between the Oregon College of Education student and the subject to determine if proper behavior modification techniques were being utilized for the particular activity engaged in.

The following describes each of the behavior modification activities. These descriptions are of the total activity, that which would be followed by a subject who at the commencement of the activity, would be unable to perform any phase of the activity. Prior to the commencement of each activity, however, a determination was made of how well each subject could perform the activity; he was then started at that phase of the activity which he was unable to perform.

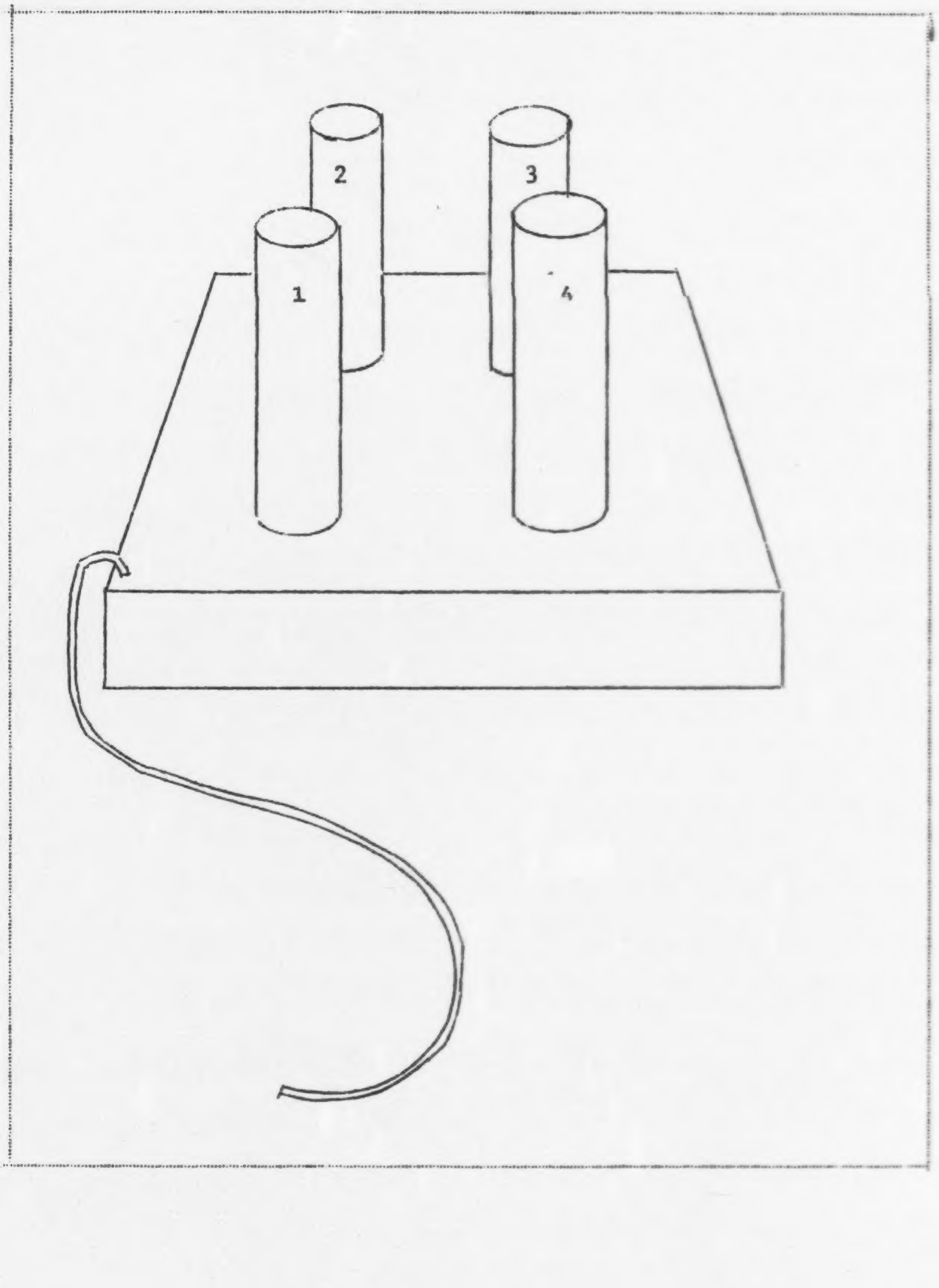
(1) String winding. The purpose of this activity was to have the subjects wind a line around four posts, going around each post separately in a clockwise direction and proceeding from post 1 to post 2 to post 3 to post 4.

The activity was separated into four phases. Phase I consisted of four posts six inches high imbedded in a square block of wood one foot square. A clothesline was used around these pegs. Upon successful mastery of this phase, phase II required the subject to wind heavy cord around pegs three inches high imbedded in a square block of wood six inches square. Phase III required the subject to wind a heavy piece of cord around pegs 1 1/2 inches high imbedded in a square block of wood three inches square. Upon completion of this phase, phase IV required the subject to wind a piece of nylon thread around four penny nails imbedded in a one inch square of wood. Figure 1 gives a graphic presentation of one of the devices used in this activity.

In performing this activity the subject was started with the first part, the foot square board and the clothesline and taught to perform the activity using a reverse chain procedure. The line was wrapped around three and 1/2 of the posts, handed to the subject and he was required to complete the last half post. It was at times necessary to guide the subject's hand to demonstrate to him what was required. Each time the subject completed

Figure 1

String Winding Equipment



winding the line around the last peg he was socially reinforced. When he was able to master three successive times the winding of the line around the last half of peg 4, he was ready to go to the next stage which involved winding the line around the entire circumference of peg 4. When he was able to do this successfully three times, he was required to wind the line around all of peg 3 and peg 4, followed by social reinforcement. When he completed this successfully, he wound the line around pegs 2, 3 and 4 followed by social reinforcement. Finally, he was required to wind the line around all four pegs followed by social reinforcement. When the subject had successfully completed the foot square board, he turned his attention to the next smaller board, phase II, and repeated the entire process. He proceeded in the same manner through phases III and IV. Social reinforcement was of course administered in the same manner.

(2) Pegs and holes. This activity consisted of three phases, three wooden peg boards with appropriate sized pegs which the student was required to place in the holes. The first phase consisted of a 1 foot square peg board with 4 holes 1 1/2 inches in diameter. There were two sizes of pegs available for this board, one whose pegs were 1 7/16 inches in diameter and the other whose pegs were 1 inch in diameter.

Phase II consisted of a 6 inch square peg board with 16 holes, each 1/2 inch wide. Two sets of pegs were also available for this board, one set being 7/16 inches in diameter and 3 inches high, and the other set 3/8 inch in diameter and 4 1/2 inches high.

The phase III peg board was 3 inches square and consisted of 16 holes, each 1/4 inch in diameter. Two sets of pegs were available for this board. One set of pegs was 2 inches high and 3/16 of an inch in diameter; another set of pegs was 4 inches high and 1/8 of an inch in diameter.

Figure 2 portrays the apparatus used in this activity.

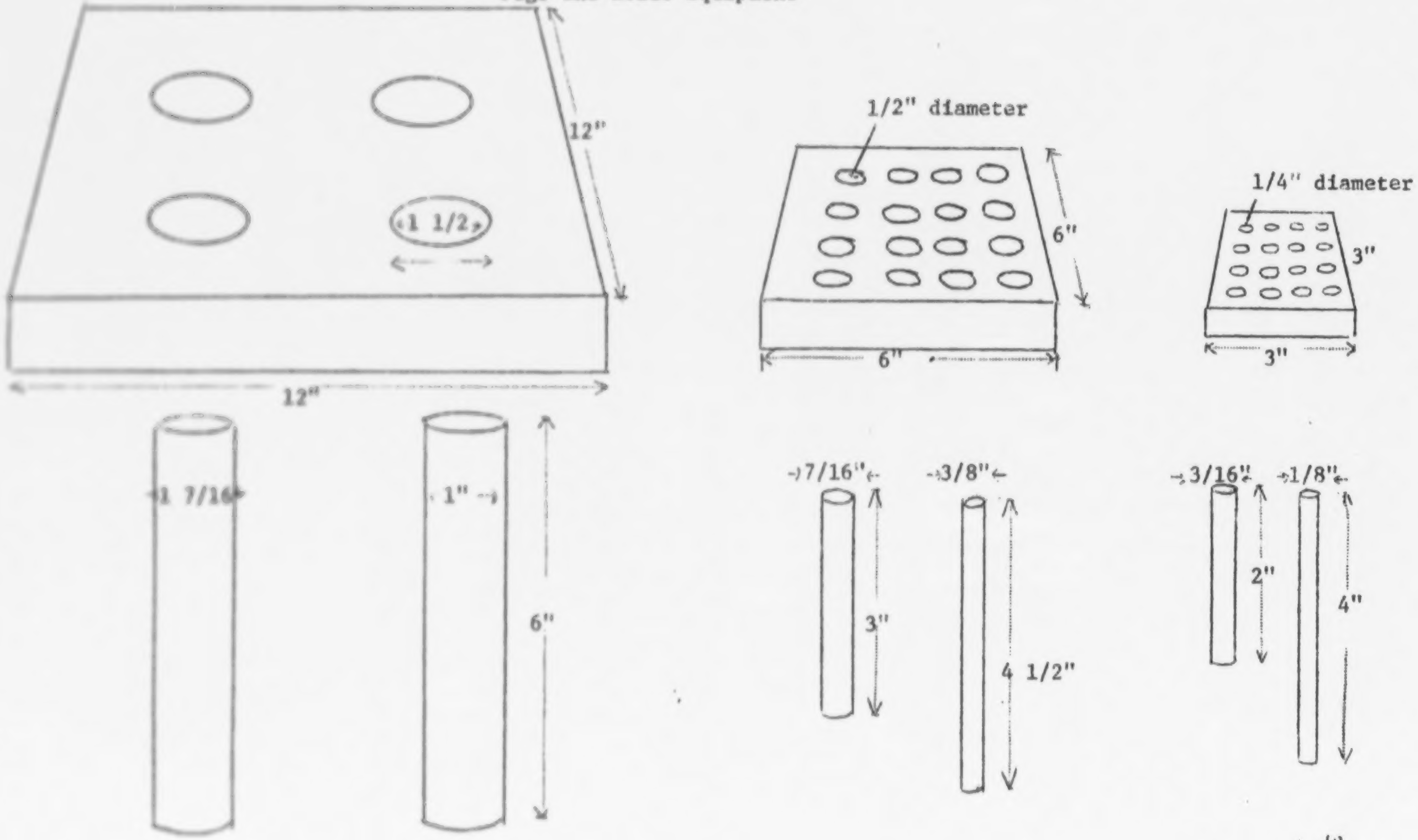
The purpose of this activity was to have the subject place all the pegs of the wider diameter in each of the peg holes. The activity began with phase I, the 1 foot square board, by the Oregon College of Education student placing three of the four smaller diameter pegs in the holes. The subject was handed the fourth peg and asked to place it in the hole. When he had completed this task he was socially reinforced. Two of the pegs were then removed and he was asked to place the two pegs in the holes and so on until he was able to place all four pegs in the holes. As in the previous activity, three consecutive completions of the task constituted success. Phase I was completed by utilizing the same reverse chain procedures and having the subject place the larger diameter pegs in the four holes.

Phases II and III followed the same procedures.

Different sized pegs in each phase were considered necessary in this activity in order to allow some of the subjects who had very poor coordination to achieve success on the peg boards.

Figure 2

Pegs and Holes Equipment


12"
1 1/2
12"
1/2" diameter
6"
6"
1/4" diameter
3"
3"
1 7/16
1"
6"
7/16"
3"
3/8"
4 1/2"
3/16"
2"
1/8"
4"

The smaller diameter pegs in each phase fell easily into the hole if the subject approximated aligning the peg and hole.

Social reinforcement was provided each of the subjects upon the completion of placing all the pegs in a board.

(3) Discs. This activity consisted of three phases, each comprising a board and appropriate round discs which were placed in the boards so that the semi-circular portion of the disc rested in a semi-circular slot. Figure 3 portrays these boards.

Phase I was a one foot square board with semi-circular slots 2 inches in diameter and 1 inch wide. Discs were made to fit into these semi-circular slots.

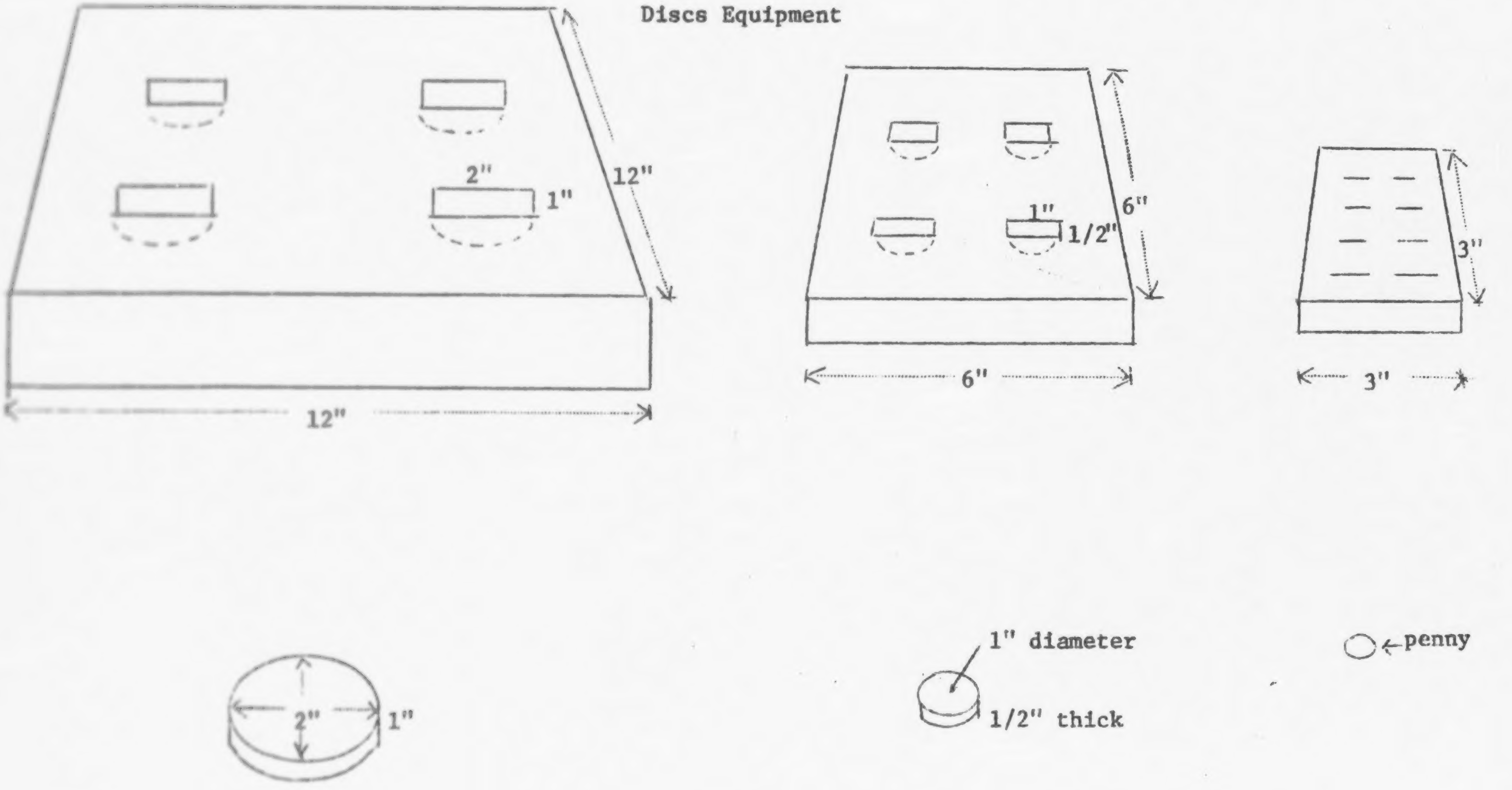
Phase II was a 6 inch square board with 4 semi-circular slots 1 inch in diameter and 1/2 inch wide. Four discs were made to fit into these slots.

Phase III was a 3 inch square board and consisted of 8 semi-circular slots designed to accommodate the American penny.

The procedure utilized in this particular activity was similar to that utilized in "Pegs and Holes". The subject was presented the largest board with 3 of the discs already in place and was asked to place the fourth disc in the slot. Upon successful completion of this activity three times, each being followed by social reinforcement, two of the discs were removed and he was required to place them in the slots. Upon successful completion of this three times, he was required to place three discs in the slots and so on, until he was able to place all of the discs in

Figure 3

Discs Equipment


2"
1"
12"
12"
1"
1/2"
6"
6"
3"
3"
2"
1"
1" diameter
1/2" thick
penny

the board. When he successfully completed the first phase, he followed the same procedure in the second and third phase.

Social reinforcement was administered to the subject each time he completed filling a board with the appropriate sized discs.

(4) Board Walking. This activity consisted of requiring the subject to walk forward on an 8 foot two by four resting on the ground. Upon successful completion of walking the entire length of the board three consecutive times the subject was required to successfully complete walking backwards along the board.

The subject was taught to walk along this board in the following manner: he was first required to balance himself on the end of the board one foot behind the other and then step off of the board by himself, after which he was socially reinforced. When he was able to do this three times, he was placed on the board one foot further back and required to take one step on the board and then step off, after which he was socially reinforced. When he was able to do this successfully three times, he was placed two feet further back on the board, required to take two steps on the board and step off by himself followed by social reinforcement. This procedure continued until he was able to walk the entire length of the board. The same technique was utilized in teaching the child to walk the board backwards.

Although this activity used the principle of reverse chaining and operant discrimination, and although it did employ some shaping behavior in that the number of steps were gradually increased, it is believed that greater success might have been achieved with a board fan shaped at one end. This would have allowed the subject to stand initially on a wider board; as he gradually moved back along the board, he would be confronted with a narrower board, which would have been more in keeping with the shaping principles utilized in other exercises in this study.

(5) Jumping. This activity started with two phases, one jumping with feet apart and the second jumping with feet together. During the course of the study, however, it was determined that jumping was such a difficult task for some of these children that the distinction between the types of jumping would be eliminated and that successful jumping was all that was required, whether the feet be together or apart. The child was required, however, first to jump forward certain specified distances and then to jump backwards a distance of six inches.

The final distance which the child was required to jump forward was decided based upon the child's size and general physical capabilities. Each child started by just being able to jump in place. When he was successfully able to complete that three times, he was required to jump forward over a line 6 inches. When he was able to successfully complete that three times, he was required to jump over a line 12 inches. If the child was old enough and strong enough, he was required to jump

18 and 24 inches. Upon successful completion of the forward jumping activity he was required to jump six inches back over a line.

In this activity, as in all others, he was required to complete each activity three times before proceeding to the next phase and was socially reinforced upon successful completion of each jump.

(6) Cutting. This activity required the child to use scissors and paper and cut out various geometrical designs. In phase I he was required to cut out an equilateral triangle 4 inches to a side. In phase II he was required to cut out a square 2 inches to a side. The third phase was the cutting out of a square 1 inch to a side, and the fourth phase required the cutting of an octagon, one inch to a side.

Reverse chaining procedure was utilized in teaching the subject to cut. For a subject unable to use the scissors, the student instructing him would cut the triangle completely out with the exception of the last cut. He would then place the triangle in the subject's hand with the scissors in the other hand, line up the scissors and the last cut to be made and the subject would press the scissors and make the cut. When the subject was able to accomplish this one cut three times by himself, the student would cut out the entire triangle with the exception of two cuts. When the subject successfully made those two cuts three times, he would be presented with three cuts. This procedure was followed around the triangle until the subject was able to cut it out successfully himself. He was then presented with phase II, the square, and was asked to cut this out completely by himself. If he demonstrated difficulty with this, a reverse chaining procedure was also utilized in the cutting of the square. This same procedure was followed for phases III and IV.

Social reinforcement was administered upon each completion of the cutting out of the design.

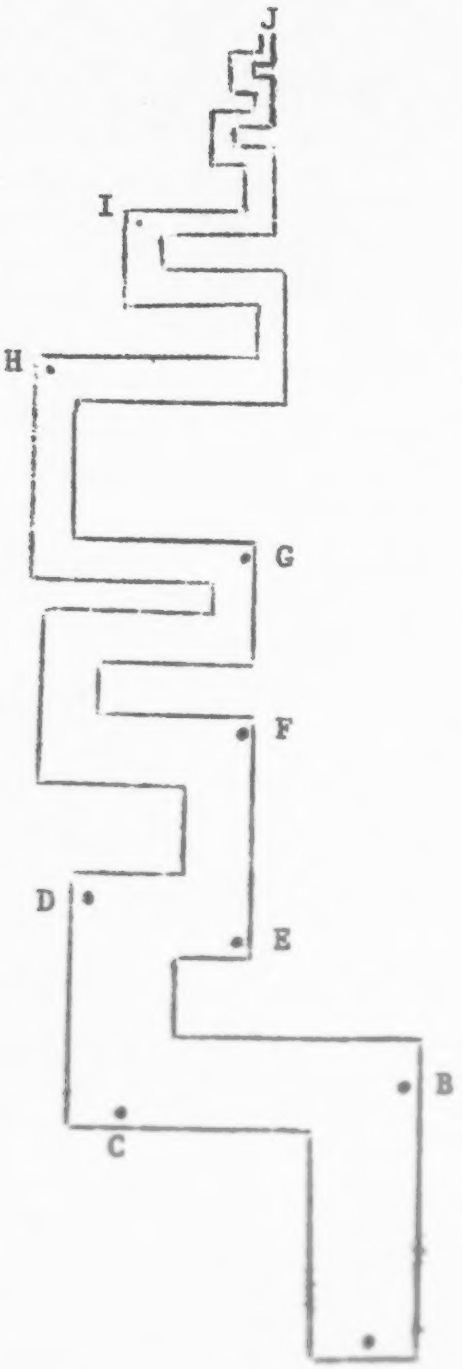
(7) Mazes. The maze activity utilized Figure 4. The procedure was as follows: the subject was first required to draw a line from point B to point A, staying of course within the boundary lines of the maze. When a student was satisfied that the subject could successfully draw three consecutive times the line from point B to point A without going outside the parallel lines, the subject was then required to draw a line from point C to A. Whe he had satisfactorily performed this part of the maze, he was required to draw a line from point D to point A, and so on back through the maze until he was able to draw a line from point J to point A. Each time, of course, that he reached point A on the maze he was socially reinforced.

(8) Pencils. The pencil activity was divided into six phases:

Phase I - Diverging Pencils: Utilizing Figure 5 the subjec was to use two pencils, one in the left hand and one in the rigt hand, start both pencils from point A and draw lines from point A to points B and C simultaneously. When he had successfully

Figure 4

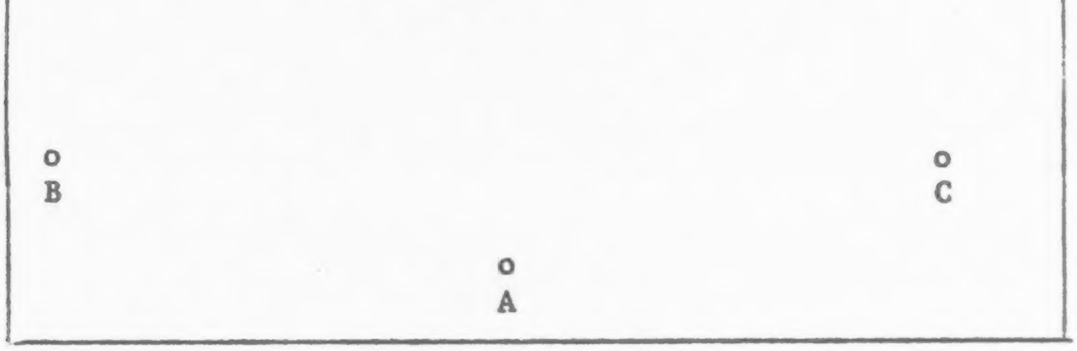
Mazes


J
I
H
G
F
D
E
B
C
A

completed this three times he was to go to the second phase of PENCILS. After each successful completion, he was socially reinforced.

Figure 5

Pencils



Phase II - Converging Pencils: Again utilizing Figure 5 the subject was required to draw lines simultaneously from points B and C to point A. When he successfully completed this three times the subject was ready for phase III. After each successful completion, he was socially reinforced.

Phase III - Clockwise Squares: The subject was required to draw clockwise two squares simultaneously holding a pencil in each hand. When he successfully completed this three times, he proceeded to phase IV. After each successful completion, he was socially reinforced.

Phase IV - Opposite Squares: The subject was required to draw two squares simultaneously with a pencil in each hand, moving the right hand clockwise and the left hand counter-clockwise. When he successfully completed this phase three times he was ready for phase V. After each successful completion, he was socially reinforced.

Phase V - Hexagons: The subject was to draw two hexagons simultaneously moving both pencils counter-clockwise. When he successfully completed this exercise he was ready for phase VI. After each successful completion he was socially reinforced.

Phase VI - Opposite Hexagons: The subject was required to draw two hexagons simultaneously moving the pencil in the right hand clockwise and the other pencil counter-clockwise. After each successful completion, he was socially reinforced. When he successfully completed this phase, the activity of pencils was completed.

Since different college students were administering the treatments to the subjects each day, there was a requirement to maintain a strict record of the accomplishment of the subject during the day's training. Thus a folder was prepared for each subject. Prior to the commencement of each morning or afternoon training period, folders of the subjects to be treated were placed in the room where they were to be treated. The student would therefore know which subjects he was to treat. Each folder contained five pieces of information.

The first bit of information was contained on the left hand side of the folder, pasted to the folder itself. This was a listing of the eight possible activities. Four of these were circled. These were the activities which the subject was to conduct that day. When the subject had successfully completed the activity in its entirety, it would be crossed out on this page and another activity circled. Thus, four were circled at all times. Appendix A contains a reproduction of that page.

The other four pieces of information contained in the folder were individual records of the subject's performance for the particular activities circled. Appendix A contains blank replicas of the records maintained for the subjects. Dates would be entered at the spaces at the top of the form. When the student finished a five minute training period on an activity with a child, the student would place an X in the appropriate square indicating at which level the subject had completed successfully three times. This would indicate to the student on the following day that he was to commence at the next level.

Utilizing this procedure, each subject received four different activities each day, spending five minutes on each activity.

Experimental Procedures: Training

A total of 80 students from Oregon College of Education and two students from Oregon State University performed the treatments on all patients. Forty-two students from Oregon College of Education were trained during the week prior to the commencement of treatment. Their training was conducted in groups ranging in size from four to eight. They were first presented a one hour lecture and demonstration on behavior modification. They were given ample opportunity to ask questions and to try out the various instructional techniques. The specific activities in which they were trained at this time were board walking, jumping, string winding, pegs and holes, discs, and cutting. This entire training session generally lasted about two to three hours.

At its conclusion each group of students was transported to the Salem Institutes for the Achievement of Human Potential where Mrs. Carol Krasch conducted instruction on the Doman-Delacato theory and system of patterning. This instruction consisted of lecture, demonstration and an opportunity for the students to apply on a live subject the patterning techniques.

During the first week of treatment, 31 more students were trained. The training procedure was essentially the same. Each of the students was given the same lecture and demonstration regarding behavior modification. Each of the students was trained in the Doman-Delacato patterning techniques.

After the first week of treatments, seven more students were recruited for the project. Their training again consisted of the same instruction in behavior modification techniques. In the Doman-Delacato patterning techniques, however, these students were taken to the treatment area at Fairview and were teamed up with experienced students and were taught the techniques of patterning using the patients who were involved in the study. These students were able to learn the techniques of patterning in less than 20 minutes in all cases.

The later behavior modification activities, namely, mazes and pencils, were initially relayed to the students via a written memorandum. (See Appendices B and C). Students were then trained in the techniques at the treatment center at Fairview. Since these additional exercises were not added to the program simultaneously but were phased in, one at a time, the training time for each of them did not significantly interfere with the treatment of subjects.

Although the training session certainly transmitted to the students the essential principles of the behavior modification techniques, reverse chaining, shaping, and reinforcing, the most important part of the instructional process of the students was the supervision afforded by the investigator and his assistant. This supervision was continuous throughout the duration of the project. The supervision was initially necessary to reinforce the instruction which the students had received during the lecture and demonstration period and to clarify specific training techniques with each of the exercises.

Supervision was necessary during subsequent weeks of the project to correct mistakes in the application of behavior modification techniques and to correct erroneous habits which some students seemed to adopt for some of the activities. For instance, there was a tendency on the board walking activity to help the subject walk the entire length of the board holding his hand with the notion that this practice would assist him in learning how to walk the board.

The necessity for this constant supervision and correction indicated to the investigator that if individuals are trained in behavior modification techniques, this training must include an intensive practicum where he is closely supervised and critiqued. The fact that it was not included in this study is considered to be a weak point in the training. It is believed that the behavior modification practices of the students improved over the time of the project because of the continuous supervision and correction rendered by the investigator and his assistant. Behavior modification results might have been more significant if an extended practicum had been part of the training of the OCE students.

Experimental Procedure: Performance

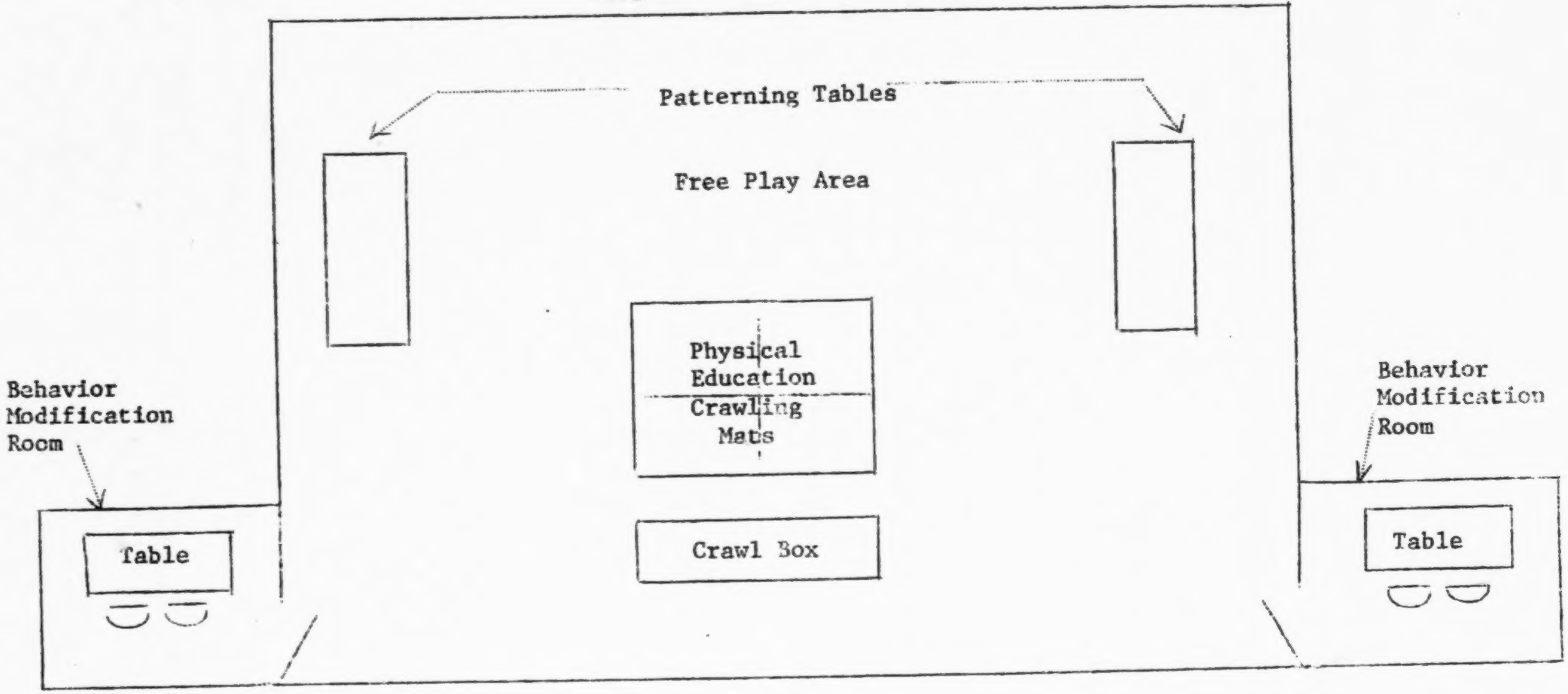
The Doman-Delacato groups and the behavior modification groups were each divided into morning and afternoon treatment groups. This division was based upon the subjects' other training commitments. For instance, the majority of the patients were required to attend school. This was usually a half day session. Consequently, they had to be scheduled on the remaining half day for their treatment in this program. It would have been desirable to rotate the subjects between morning and afternoon treatment sessions. However, this was not possible because of the commitment to school schedules.

The same procedure was followed in the morning and the afternoon. Subjects were picked up at their cottages by the Oregon College of Education students and delivered to the second floor of the multipurpose building at Fairview Hospital and Training Center where all treatments were conducted. A diagram of the treatment area is contained in Figure 6.

When the Oregon College of Education students met the subjects at their various cottages, they pinned a name tag to the subject's back. Green name tags were used for those receiving the Doman-Delacato treatment. White name tags were used for those receiving the behavior modification treatment.

Figure 6

Diagram of Treatment Center


Patterning Tables
Free Play Area
Physical Education Crawling Mats
Crawl Box
Behavior Modification Room
Table
Behavior Modification Room
Table

At the treatment center the Oregon College of Education students were divided into teams. These teams would rotate among the two patterning tables, the behavior modification treatment rooms, and the crawl box area. Rotation occurred approximately every half hour. This rotation was considered necessary for two major reasons: the Doman-Delacato Treatment method required a continuous movement of arms by the Oregon College of Education students and this was very tiring to many of the students. The behavior modification techniques required intense concentration and attention to the performance of the subjects and the reinforcement given the subjects. Therefore, rotation between these activities was considered desirable to prevent fatigue and loss of efficiency. This rotation was also considered necessary to balance out specific characteristics or habits developed by the OCE students. Time of rotation was dictated by the supervisor present.

Supervision was conducted on a half day basis by either the investigator or the assistant investigator. For the last five weeks of the project a graduate student majoring in special education at Oregon College of Education, who had been trained by the principal investigator, supervised on two 1/2 days a week.

The treatment of the subjects in both the Doman-Delacato patterning procedures and the behavior modification procedures was generally faithfully accomplished, except in those rare instances when an insufficient number of Oregon College of Education students were present and four treatments were impossible to achieve. In those instances most subjects received at least three treatments. The absence of Oregon

College of Education students was primarily due to other academic commitments or to illness.

Some comments are worth noting about the behavior modification techniques used in this study. (1) As has already been mentioned it is the opinion of the investigator that for individuals to learn adequately behavior modification techniques, they not only need instruction and demonstration but they also need an intensive supervised practicum so as to eliminate many erroneous ideas or habits which may develop. (2) No subject was able to successfully complete all of the scheduled activities in the behavior modification series. No subjects failed to advance in at least three of the activities which were scheduled for him.

Evaluation.

Two evaluation instruments were utilized, the Doman-Delacato Profile and a modified version of the Lincoln-Oseretsky Motor Development Scale.

The Doman-Delacato Profile was administered to groups A, B and C two weeks prior to the commencement of treatment. This profile was administered by the Executive Director of the Institutes for the Achievement of Human Potential in Oregon. In each case when she administered the profile, she was unaware of which treatment each subject was to receive. This situation prevailed during the course of the entire study. Although the study was designed to merely measure improvement in coordination, the scores reported for the Doman-Delacato

Profile reflect total profile scores due to the difficulty in deriving coordination scores from the profile. The Doman-Delacato Profile was administered on an individual basis to all students at the same time of the day and at the same location each time. Groups A, B and C received follow-up profiles two weeks after the commencement of treatment, four weeks after the commencement of treatment, and six weeks after the commencement of treatment. All subjects in all six groups were administered the Doman-Delacato Profile at the conclusion of treatment and three months after the completion of treatment. This latter profile is referred to as the follow-up profile.

The Lincoln-Oseretsky Motor Development Scale was chosen as the second evaluation instrument. Although most literature indicated that this was the best scale to use with this population to measure coordination, few references could be uncovered which indicated that this scale had actually been used with this type of population. Therefore, it was determined that it would be necessary to conduct a small pilot effort to uncover difficulties of testing. The test was administered to a group of 14 mongoloids who were not participating in the study and who were of the same age group as the subjects in the study. This pilot effort indicated that the low level of the test was much too high to allow many of the subjects to achieve a score. It was therefore necessary to modify the Lincoln-Oseretsky Motor Development Scale in order to lower the starting level of the test. The modified version of the scale is included as Appendix C. A discussion of each of the changes follows:

The equipment and materials needed have been modified to reflect the changes in each of the items.

The lettering and numbering has been modified so as to provide a series of items which are listed in general order of difficulty. For instance, Series A and the items numbered in it, A-1 through A-5, constitute a walking series. In the original Lincoln-Oseretsky Motor Development Scale the only items concerned with walking in individual exercise is item 1 which is walking backwards. It was found that walking backwards was a difficult chore for trainable retardates. Consequently, four easier items, A-1 through A-4, were inserted to be administered prior to A-5, walking backwards. The balancing on tip toe has been modified so that it is performed first with eyes open, which is item B-1, and then with eyes closed, which is item B-2.

The Lincoln-Oseretsky item for standing heel to toe is done with eyes closed. Item B-3 has the subject standing heel to toe with eyes open; item B-4 has him standing heel to toe with eyes closed.

The Lincoln-Oseretsky Motor Development Scale requires the subject to stand on one foot for 10 seconds with their hands on the outside of the thighs. We found that it was necessary to modify this item to have the subject stand on one foot for only five seconds with his hands on his hips. The time has also been modified for standing on one foot with eyes closed.

The crouching on tip toe item has been modified to where the subject now stands on tip toe, one item with eyes open and the other with his eyes closed.

The Lincoln-Oseretsky items for jumping and touching heels, and jumping and clapping have been modified and combined into one item where the subject just jumps on his toes rapidly.

The Lincoln-Oseretsky item opening and closing hands has essentially been eliminated.

It was determined that jumping over ropes was much too difficult for many of the subjects and although the item was left in, three preliminary items were inserted in an attempt to lower the starting level, stepping over a knee-high obstacle, ducking under a shoulder-high obstacle, and passing between an obstacle and a wall.

In the catching ball item on the Lincoln-Oseretsky Motor Development Scale it was found that it was necessary to insert an item to have the subject attempt to catch the tossed ball with two hands instead of one, another item to have the subject bounce the ball and catch it with one hand five times without dropping it before attempting the item requiring the catching of the ball with one hand.

The item on the Lincoln-Oseretsky Motor Development Scale entitled, "Making a ball" was eliminated entirely because it was found that it was too difficult to explain to this level of retardate the desired skills.

The items "Describing Circles in Air", "Jumping in Air, About Facing, and Landing on Tip Toes", and "Tapping Feet and Describing Circle with Fingers" were eliminated and in their place was substituted an item entitled, "Imitations of Movements". All of the eliminated items were found to be too difficult for this level of retardate. The imitations of movements was another item designed to lower the floor of the test.

In addition to the changes already mentioned, the timing and scoring was changed in many cases to help the subjects achieve a score, especially on the timed items.

It is recognized that the changes that were made in the Lincoln-Oseretsky Motor Development Scale are substantial. However, it was the experience of the investigator and his assistants that the scale was the most suitable for the purposes which we desired, and yet was not appropriate for this low level of retardate. This experience was corroberated by others who have attempted to administer the Lincoln-Oseretsky Motor Development Scale both at Fairview and at Pearl Buck Center. Therefore, the modification, although not a normed test, resulted in a means of achieving a score which was modeled after the original Lincoln-Oseretsky Motor Development Scale.

Despite the fact that the scale was modified to allow the lowest retardates to score, some did not. In each of the groups it will be noted in the results of the study that some subjects failed to achieve a score. This is believed not to be a function of item difficulty but a function of the testing situation per se, since observation during training of these subjects indicated that in every case they did exhibit some of these coordination skills in non-test situations. Either because they did not understand the instructions or because the testing situation was too strange for them, they did not perform on the test. The interpretation of zero scores must to some degree be questioned.

Because of this doubt as to the validity of the test measuring at least some motor capability on their part, the scores reported herein will be divided according to those who were able to achieve scores and those who did not achieve scores.

The Lincoln-Oseretsky Motor Development Scale was administered by a psychometrist from Teaching Research Division of the Oregon State System of Higher Education. He, like the Executive Director of the Oregon Institutes for the Achievement of Human Potential, was not aware of which subject was receiving which treatment. The test schedule for the modified version of the Lincoln-Oseretsky Motor Development Scale was the same as the schedule utilized for the Doman-Delacato Profile.

CHAPTER IV

FINDINGS

Analysis of Data

Since two scales, the modified version of the Lincoln-Oseretsky Motor Development Scale and the Doman-Delacato Profile, were used to determine if treatments had any effect upon motor development, the results obtained from each of these measures will be treated separately. Correlations between the two measures were computed.

Modified Lincoln-Oseretsky Motor Development Scale

Groups A (Doman-Delacato Treatment Group), B (Behavior Modification Treatment Group), and C (Control Group) were pretested one week prior to the commencement of the treatment program. They were tested at a two week period during the treatment program, at four weeks, at six weeks, and together with groups D (Doman-Delacato Treatment Group), E (Behavior Modification Treatment Group), and F (Control Group) were posttested at the conclusion of the program. Results of each of these testings for groups A, B and C are shown in Appendix E. The test was administered by a psychometrist from Teaching Research Division of the Oregon State System of Higher Education. He was unaware of which subjects were receiving which treatments.

Although subjects were assigned to each of the groups on a random basis after being sorted by age and by sex, an examination of the pretest scores of the three groups was considered necessary in light of the small N to determine if there were any major differences among the groups prior to the beginning of treatment. The data, although recorded in Appendix E are shown in Table VII in a more graphic manner. Since an examination of Table VII indicates that group B has a mean higher than either of the other two groups, t-values were computed to determine whether this difference was statistically significant. The results of these t-tests are shown in Table VIII. None of the t-values are significant at even the .20 level of confidence, affirming that differences between groups A, B and C prior to the commencement of treatment were well within the discrepancies expected from chance selection.

To test the null hypothesis that there were no differences in mean motor coordination posttest scores for subjects periodically tested and subjects tested only at the conclusion of the treatment program, t's were computed between groups A and D, B and E, and C and F. The post scores and the means achieved on the modified Lincoln-Oseretsky Scale by all groups are compiled in Appendix F and graphically portrayed in Table IX. Table X summarizes the results of the t-tests for differences in mean final scores between the periodically tested groups and the posttested only groups. All t's were less than 1.00, the largest failing to achieve significance at even the .30 level. Clearly the data suggest no effect due to periodic testing. The hypothesis of no differences in mean motor coordination posttest scores on the

Table VII

Grouped pretest scores of groups A, B, and C on the modified Lincoln-Oseretsky Motor Development Scale.

91-95			
86-90		x	
81-85			
76-80			
71-75			
66-70		x	
61-65	x		
56-60			
51-55		x	
46-50		x	x
41-45	x	x	x
36-40			
31-35	x x	► x	
26-30			x
21-25			x x x
16-20	►	x	► x
11-15			
6-10	x x x		x
0-5	x x x	x x x x	x x x
	Group A	Group B	Group C
	N=10	N=11	N=11
	$\overline{A} = 20.00$	$\overline{B} = 32.73$	$\overline{C} = 18.73$

► Designates mean

Table VIII

Results of t tests of mean differences of pre-scores of groups A, B and C on the modified Lincoln-Oseretsky Motor Development Scale.

	A	B	A	C	B	C
N	10	11	10	11	11	11
Mean	20.00	32.73	20.00	18.73	32.73	18.73
Mean Diff.	12.73		1.27		14.00	
σ	21.60	30.25	21.60	15.99	30.25	15.99
$\sigma_{M_1-M_2}$	26.50		18.86		24.19	
t	1.09		.15		1.36	

Table IX

Grouped post scores achieved on the modified Lincoln-Oseretsky Motor Development Scale.

Scores	Doman-Delacato'	Behavior Modification	Control
116-120		x	
111-115	o	xo	
106-110	o		
101-105		x	
96-100			
91-95		o	
86-90	o		x
81-85		xo	
76-80	xo		
71-75		o	o
66-70	o	xo	xo
61-65	xxo	x	
56-60		▶ *	x
51-55	x	▷ xo	
46-50			xx
41-45	▷		
36-40	* o		xo
31-35	▶ o		▶ o
26-30			* xo
21-25			▷ x
16-20	xx	o	
11-15	oo	o	xoo
6-10	x	xo	oo
0-5	xxxo	xxxo	xxoo

x = Individual Scores of Groups A, B, C (pretested groups)
o = Individual Scores of Groups D, E, F (no pretest)
* = Mean of treatment
▶ = Mean of pretested group
▷ = Mean of non-pretested group

Table X

Results of t-tests of mean differences in post scores on the modified Lincoln-Oseretsky Motor Development Scale between periodically tested groups and posttested only groups.

	A	D	B	E	C	F
N	10	11	11	10	11	11
Mean	30.10	43.27	56.36	52.70	34.63	24.90
Mean Diff.	13.17		3.66		9.72	
σ	29.82	36.22	45.85	40.93	22.28	25.68
$\sigma_{M_1-M_2}$	33.34		43.59		24.02	
t	.90		.19		.94	

modified Lincoln-Oseretsky Motor Development Scale for subjects periodically tested and subjects tested at the conclusion of the treatment is well supported.

The major hypothesis, that there would be no differences in mean motor coordination scores for subjects receiving either the Doman-Delacato method of treatment, the behavior modification method of treatment, or no treatment was examined in terms of t's computed for the mean differences in posttest modified Lincoln-Oseretsky Motor Development Scale scores between each of the treatment groups. The results of these computations are shown in Table XI. As can be determined from the table, a significant difference at the .05 level was obtained between the behavior modification treatment groups and the control groups. There were no significant differences in post mean scores between the Doman-Delacato treatment groups and the control groups, nor were there any significant differences in the post mean scores between the Doman-Delacato treatment groups and the behavior modification treatment groups.

A matter of prime concern was the question whether gains achieved during treatment would be maintained after a period of no treatment. A three month waiting period of no treatment for any of the children was decided upon after the completion of post testing. At the end of these three months, all children were once again tested. The scores achieved on the modified Lincoln-Oseretsky Motor Development Scale during the follow-up testing are contained in Appendix G. Matched t's were computed for each of the pairs of post and follow-up

Table XI

Results of t-tests of mean differences in post scores on the modified Lincoln-Oseretsky Motor Development Scale among the Doman-Delacato treatment groups (A/D), the Behavior Modification treatment groups (B/E), and the Control groups (C/F).

	A/D	B/E	A/D	C/F	B/E	C/F
N	21	21	21	22	21	22
Mean	36.91	54.62	36.91	29.77	54.62	29.77
Mean Diff.	17.71		7.14		24.85	
σ	33.11	42.53	33.11	23.96	42.53	23.96
$\sigma_{M_1-M_2}$	38.11		28.79		34.30	
t	1.51		.81		2.37*	

* Significant at .05 level.

tests and are reported in Table XII. As can be seen, there are no significant differences with the t's ranging from .17 to 2.20.

Table XIII portrays the same information in another manner. Among the Doman-Delacato groups, groups A and D, there were eleven gains in follow-up testing and six losses while four scores remained the same. No gain exceeded thirteen points and no loss exceeded eight points. In the behavior modification groups, groups B and E, there were ten gains in follow-up testing and eight losses while three scores remained the same. No gains were higher than eleven points and no losses were greater than twelve points. Groups C and F, the control groups, exhibited the same general pattern, nine gains and nine losses and three scores remaining the same, and a variability from gains of twelve to losses of fourteen.

Differences between the follow-up scores on the modified Lincoln-Oseretsky Motor Development Scale for the Doman-Delacato treatment groups, the behavior modification treatment groups and the "no treatment" groups were examined in terms of t-tests. Table XIV contains the results of these t-tests. The pattern of significant and non-significant t's was identical to that for the posttest scores obtained three months earlier. The only significant difference obtained was that between the behavior modification treatment method and the "no treatment" group. As with the posttest scores, the modified Lincoln-Oseretsky Motor Development Scale scores for the Doman-Delacato treatment method were not significantly different from those for the "no treatment" group or from the behavior modification treatment group.

Table XII

Results of matched t-tests of mean differences between posttest scores and follow-up test scores on the modified Lincoln-Oseretsky Motor Development Scale.

	A		B		C		D		E		F	
	1	2	1	2	1	2	1	2	1	2	1	2
N	10	10	11	11	11	11	11	11	10	10	10	10
Mean	30.10	31.40	56.37	52.91	34.64	35.09	43.09	43.82	52.70	56.00	26.70	25.00
Mean Diff.*	1.30		-3.46		.45		.73		3.30		-2.70	
σ	43.50	30.13	43.60	42.84	22.22	24.80	36.11	37.77	40.93	39.90	26.34	25.56
t *	1.02		-1.65		.17		.43		2.20		-1.05	

* Negative value indicates lower follow-up score

1 = posttest

2 = follow-up test

Table XIII

Results of the follow-up tests compared with the posttests on the modified Lincoln-Oseretsky Motor Development Scale.

Gain or Loss	A	B	C	D	E	F
+14						
+13			x	x		
+12						
+11			xx		x	
+10					x	
+ 9	x					
+ 8						
+ 7						
+ 6		x			xx	
+ 5		x				
+ 4	x	x		xx		
+ 3	x			x		xxx
+ 2	xxx		x		xx	x
+ 1		x	x	x		
0	xx	x	x	xx	xx	xx
- 1			x	x	x	
- 2						x
- 3			x	x	x	
- 4						
- 5	x	x	x	x		
- 6	x	x				
- 7						x
- 8		xx	x			x
- 9		x				x
-10			x			
-11						
-12		x				
-13						
-14			x			

Table XIV

Results of t-tests of mean differences of follow-up scores on the modified Lincoln-Oseretsky Motor Development Scale among the Doman-Delacato treatment groups (A/D), the Behavior Modification treatment groups (B/E), and the Control groups (C/F).

	A/D	B/E	A/D	C/F	B/E	C/F
N	21	21	21	21	21	21
Mean	37.91	54.38	37.91	30.29	54.38	30.29
Mean Diff.	16.47		7.62		24.09	
σ	34.09	40.46	34.09	25.06	40.46	25.06
$\sigma_{M_1-M_2}$	37.41		29.92		33.65	
t	1.43		.83		2.32*	

* Significant at the .05 level.

Table XV

Results of *t*-tests of mean differences in post scores of gross and fine motor coordination on the modified Lincoln-Oseretsky Motor Development Scale among the Doman-Delacato treatment groups (A/D), the Behavior Modification treatment groups (B/E), and the control groups (C/F).

Gross Motor Coordination

	A/D	B/E	A/D	C/F	B/E	C/F
N	21	21	21	22	21	22
Mean	21.86	31.19	21.86	16.32	31.19	16.32
Mean Diff.	9.33		5.54		14.87	
σ	19.67	24.84	19.67	12.46	24.84	12.46
$\sigma_{M_1-M_2}$	22.41		16.38		19.51	
t	1.35		1.11		2.50*	

Fine Motor Coordination

	A/D	B/E	A/D	C/F	B/E	C/F
N	21	21	21	22	21	22
Mean	15.05	23.43	15.05	13.46	23.43	13.46
Mean Diff.	8.38		1.59		9.97	
σ	14.18	18.38	14.18	12.28	18.38	12.28
$\sigma_{M_1-M_2}$	16.42		13.24		15.56	
t	1.65		.39		2.10*	

* Significant at the .05 level.

coordination but produces an effect on both.

As was pointed out in Chapter III, there was concern that the Lincoln-Oseretsky Motor Development Scale would not adequately measure the lower level of retardate. Consequently, the test was modified in order to lower the low level of the test so that these children would be able to achieve scores. However, eight were still unable to score. (See Appendices VII and IX.)

The several analyses reported above included the twelve subjects with zero scores on their first testing.[1] In view of the questionable interpretability of these zero scores, the major posttest score analysis was recomputed eliminating the data for these twelve subjects. The recomputed t's are presented in Table XVI. The results followed the same pattern as those attained with the zero scores included. A t

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[1] It was agreed by both students and investigators that although some children were unable to achieve scores on the modified Lincoln-Oseretsky Motor Development Scale, their performance improved measurably during the time of the study. The children were more outgoing, more active and more responsive to the adults around them. This difference in attitude and performance, although not measurable by any scale available was noticed by the attendants on the wards in the majority of cases of children receiving either the Doman-Delacato or the behavior modification treatment methods.

It was felt both by the principal investigator and his assistant that the results achieved by some subjects on the modified Lincoln-Oseretsky Motor Development Scale were not indicative of their performance capabilities. Three of the children who did not score on the test did have in their repertoire of abilities the capability of performing some of the items on the test. However, when faced with the testing situation and a person previously unknown to them, the psychometrist, they reverted to extreme shyness and refused to move or participate in any way. Therefore, in administering tests to these children, it may be necessary for the psychometrist to spend more time developing rapport with the child prior to administering the test.

Table XVI

Results of t-tests of mean differences in post scores with all zero scores removed on the modified Lincoln-Oseretsky Motor Development Scale among the Doman-Delacato treatment groups (A/D), the behavior modification treatment groups (B/E), and the control groups (C/F).

	A/D	B/E	A/D	C/F	B/E	C/F
N	17	18	17	17	18	17
Mean	45.29	63.50	45.29	37.47	63.50	37.47
Mean Diff.	18.21		7.82		26.03	
σ	31.26	39.28	31.26	21.62	39.28	21.62
$\sigma_{M_1 - M_2}$	35.61		26.87		31.96	
t	1.51		.85		2.41*	

* Significant at the .05 level.

value of 2.41 (significant at the .05 level) was the only significant difference attained and this was between the post mean scores of subjects receiving the behavior modification method of treatment and those who received no treatment. Apparently, the removal of zero scores from the study has no effect upon the outcomes cited earlier.

The question arises whether or not there are differences in treatment trends for subjects receiving the various treatments. A trend analysis (following McNemar, 1962) for groups A (Doman-Delacato), B (Behavior Modification), and C (Control) on the modified Lincoln-Oseretsky Motor Development Scale was computed. The results of the trend analysis are summarized in Table XVII. Significance was achieved at the .01 level both between trials and in the interaction between treatment and trial. The significance for the trials indicates that there is a significant increase in the means of the combined three treatment groups over the ten weeks of treatment and testing. The significant interaction means that the differences between the slopes of the testing means for the three treatments are greater than expected by chance. Figure 7 presents the graphs of the mean scores for the several testing periods for the three treatment groups. Although each group trend is essentially linear and increasing monotonically, the behavior modification curve rises at a much sharper slope than does either the curve for the Doman-Delacato group (A) or the control group (C).

The fact that the behavior modification group mean is approximately 13 score points higher than either the Doman-Delacato group or the control group at the start of the experimental program somewhat clouds

Table XVII

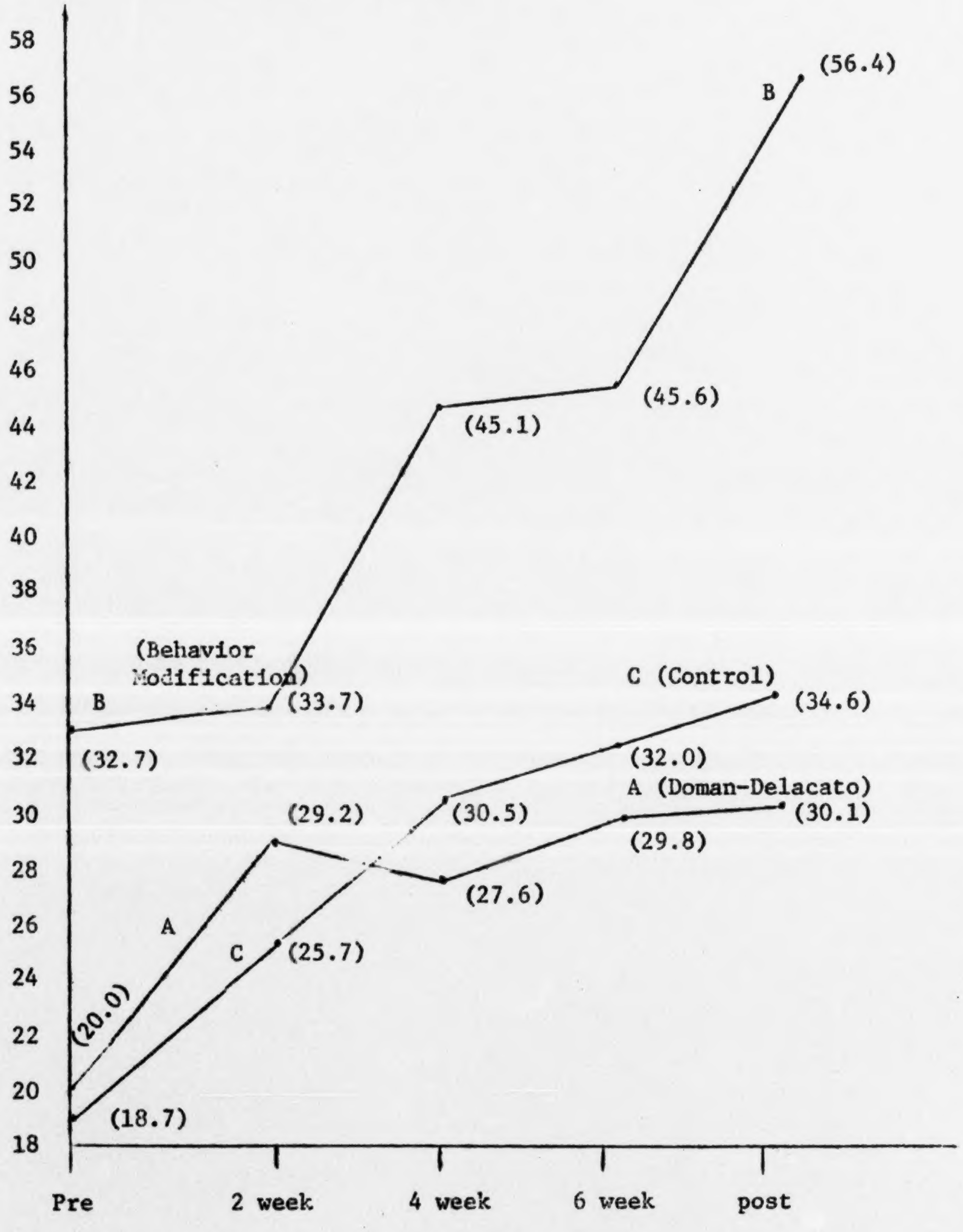
Trend analysis results of repeated tests of groups A, B and C, on the modified Lincoln-Oseretsky Motor Development Scale.

Source	df	SS	MS	F
Treatment	2	8,140.373	4,070.1865	.937
Error (treat)	29	125,886.275	4,340.906	
Trials	4	5,285.005	1,321.251	21.612*
Treatment x Trials	8	1,416.242	177.030	2.896*
Error (trials)	116	7,092.225	61.134	
Total	160	147,820.120		

* Significant at the .01 level.

Figure 7

Profile of mean scores achieved by groups A (Doman-Delacato), B (Behavior Modification), and C (control) on the modified Lincoln-Oseretsky Motor Development Scale.



the interpretability of the obtained trend differences and the much larger posttest difference favoring the behavior modification treatment by approximately 23 score points. The possible importance of initial scores upon gain scores can be further seen in Figure 8. Those who scored less than 10 in the pretest averaged gains of 4.57 points while those who scored higher than 10 in the pretest averaged gains of 26.22 points. A breakdown of gains by treatment groups is contained in Table XVIII.

Table XVIII

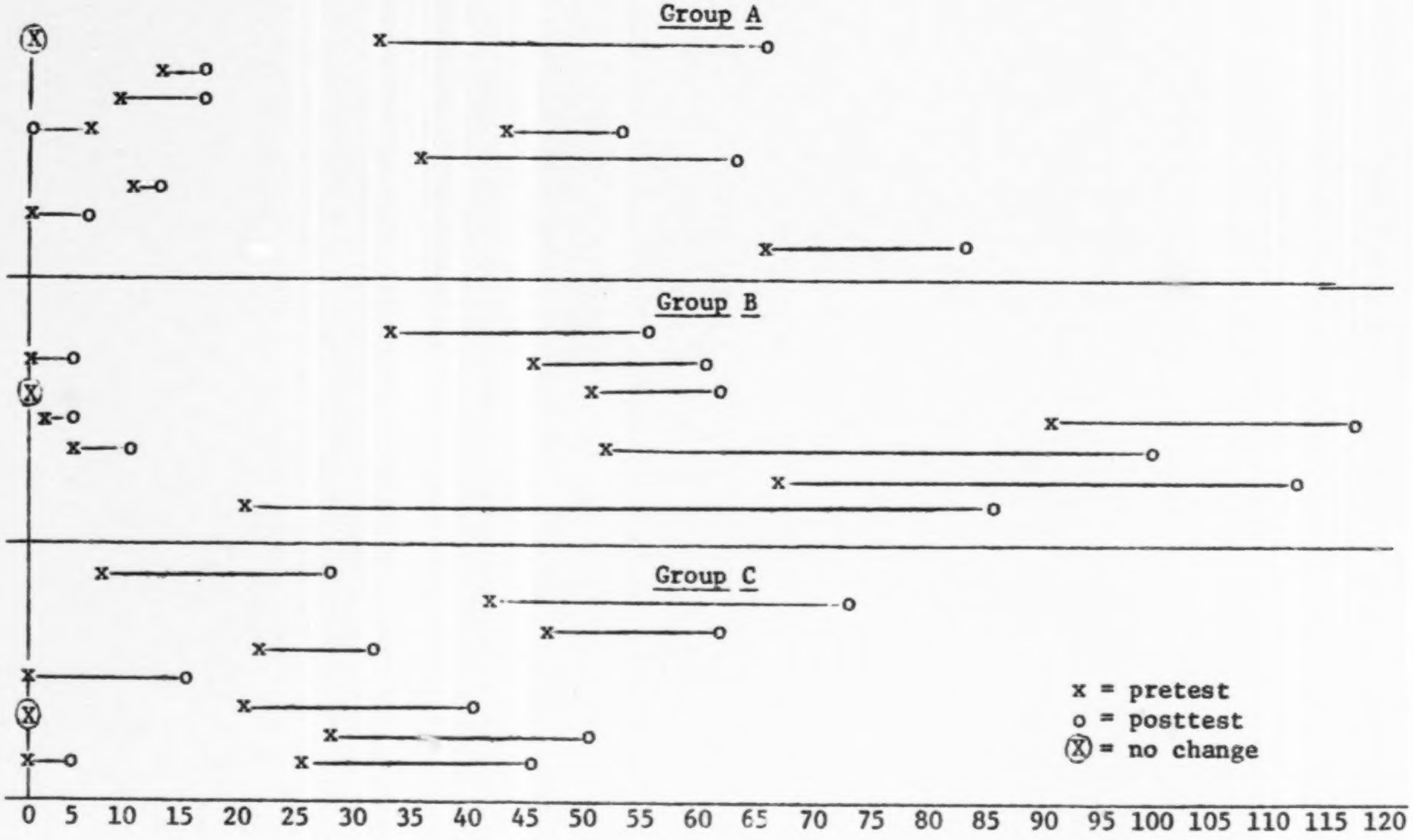
Average gains in scores between pretests and posttests on modified Lincoln-Oseretsky Motor Development Scale of children in groups A, B and C, dichotomized by those receiving more or less than 10 on the pretest.

Group		N	$\overline{X}$
A	less than 10	6	2.83
	more than 10	4	21.00
B	less than 10	4	2.50
	more than 10	7	35.71
C	less than 10	4	9.25
	more than 10	7	19.71
Total			
	less than 10	14	4.57
	more than 10	18	26.22

It would seem therefore that children with the greater retardation at the commencement of the program benefitted least regardless of treatment programs.

Figure 8

Gain scores of groups A (Doman-Delacato), B (Behavior Modification), and C (Control) on the modified Lincoln-Oseretsky Motor Development Scale



x = pretest
o = posttest
ⓧ = no change

Doman-Delacato Profile

The Doman-Delacato Profile was administered to the same subjects on the same schedule as the modified Lincoln-Oseretsky Motor Development Scale. It was administered to groups A (Doman-Delacato), B (Behavior Modification), and C (Control) as a pretest measure, at the end of two weeks of treatment, at the end of four weeks, six weeks, as a posttest measure and as a follow-up measure. It was administered to groups D (Doman-Delacato), E (Behavior Modification), and F (Control) as a posttest measure and as a follow-up measure. In all cases the administration of the test was conducted by the Executive Director of the Oregon Institutes for the Achievement of Human Potential. This individual did not know which subject was receiving which treatment. Appendix I contains the results of the testing for groups A, B and C.

A _t_-test of the significance between the mean scores of groups A, B and C on the pretest of the Doman-Delacato profile indicated no significant differences. The results of those _t_-tests are shown on Table XIX, affirming the fact that no differences other than chance differences existed between the three groups prior to the commencement of treatment.

To test the null hypothesis that there were no differences in mean motor coordination posttest scores for subjects periodically tested and subjects tested only at the conclusion of the treatment program, _t_'s were computed between groups A and D, B and E, and C and F. The post scores and the means achieved on the Doman-Delacato Profile by all groups are compiled in Appendix J, and Table XX summarizes the results

Table XIX

Results of *t*-tests of mean differences of pre-scores of groups A (Doman-Delacato), B (Behavior Modification) and C (Control) on the Doman-Delacato Profile.

	A	B	A	C	B	C
N	10	11	10	11	11	11
Mean	28.70	35.14	28.70	30.95	35.14	30.95
Mean Diff.	6.44		2.25		4.19	
σ	12.46	15.10	12.46	11.13	15.10	11.13
$\sigma_{M_1-M_2}$	13.91		11.78		13.26	
t	1.06		.44		.74	

Table XX

Results of t-tests of mean differences in post scores on the Doman-Delacato Profile between periodically tested groups and posttested only groups.

	A	D	B	E	C	F
N	10	11	11	10	11	11
Mean	32.1500	33.1364	38.7727	32.9500	33.8182	26.8182
Mean Diff.	.9864		5.8227		7.0000	
σ	13.28	10.13	17.71	10.37	13.47	12.52
$\sigma_{M_1-M_2}$	11.73		14.69		13.00	
t	.19		.91		1.26	

of the t-tests between the periodically tested groups and the post tested only groups. t's of .19, .91, and 1.26 were obtained for the comparisons of the Doman-Delacato groups, the behavior modification groups and the control groups, respectively. None of these t's approached significance at the .05 level, indicating no significant effect due to periodic testing. The conclusion is one of no differences in mean motor coordination Doman-Delacato Profile posttest scores for subjects periodically tested and subjects tested at the conclusion of the treatment.

The major hypothesis that there would be no differences in coordination scores for subjects receiving either the Doman-Delacato method of treatment, the behavior modification method of treatment, or no treatment was examined in terms of t's computed for the mean differences between each of the treatment groups. The results of these computations are contained in Table XXI. t's of .82, .62, and 1.34 were obtained for the comparison of the Doman-Delacato group with the behavior modification group, the Doman-Delacato group with the control group, and the behavior modification group with the control group, respectively. None of these t's approach significance at the .05 level. The conclusion is one of no differences in mean motor coordination Doman-Delacato Profile scores for subjects receiving the Doman-Delacato method of treatment, the behavior modification method of treatment, and no treatment.

The Doman-Delacato Profile was also administered as a follow-up measure after a three month period of no treatment. The scores achieved during the follow-up testing are summarized in Appendix K. Matched

Table XXI

Results of t-tests of mean differences in post scores on the Doman-Delacato Profile among the Doman-Delacato treatment groups (A/D), the behavior modification treatment groups (B/E), and the control groups (C/F).

	A/D	B/E	A/D	C/F	B/E	C/F
N	21	21	21	22	21	22
Mean	32.67	36.00	32.67	30.32	36.00	30.32
Mean Diff.	3.33		2.35		5.68	
σ	11.44	14.63	11.44	13.19	14.63	13.19
$\sigma_{M_1-M_2}$	13.13		12.37		13.91	
t	.82		.62		1.34	

t's were computed for each of the pairs of post and follow-up tests. These t's ranged between 1.5 and .77 as reported on Table XXII, none of them reaching significance at the .05 level. The hypothesized stability of the scores achieved on the Doman-Delacato Profile over the three month post experimental period is supported. Examination of the individual scores further supports this conclusion. Of the 64 subjects with follow-up test scores, only nine earned non-identical Doman-Delacato Profile scores on the two testings; four of these nine subjects were in the Doman-Delacato groups, three in the behavior modification groups, and two in the control groups. The score changes ranged from a gain of four score points for one behavior modification subject to a loss of one point, also for a behavior modification subject, with most subjects changing less than a point. The stability of post experimental Doman-Delacato Profile scores is very similarly evident in all groups; any losses or gains made during the experimental period were not modified to any significant degree over the subsequent month period.

Inter-treatment group t's computed for the follow-up tests followed an identical pattern of non-significance as obtained for the post tests described earlier in Table XXI. The t's ranged between .48 and 1.18, as shown in Table XXIII. The differences between mean coordination follow-up scores for subjects receiving the Doman-Delacato method of treatment, the behavior modification method of treatment, and no treatment remain non-significant.

The trend analysis for the Doman-Delacato Profile scores is reported on Table XXIV. The mean scores for the several testing periods for

Table XXII

Results of the follow-up tests compared with the posttests on the Doman-Delacato Profile.

	A		B		C		D		E		F	
	1	2	1	2	1	2	1	2	1	2	1	2
N	10	10	11	11	11	11	11	11	10	10	10	10
Mean	32.15	32.25	38.77	39.05	33.82	33.73	33.14	33.36	32.95	32.90	26.82	27.95
Mean Diff.	.10		.28		.09		.22		.05		.15	
σ	13.28	13.54	17.71	18.05	13.47	13.21	10.13	10.37	10.37	10.22	12.52	13.64
t	1.50		.71		1.00		1.24		1.00		1.00	

1 = Posttest

2 = Follow-up test

Table XXIII

Results of *t*-tests of mean differences of follow-up scores on the Doman-Delacato Profile among the Doman-Delacato treatment groups (A/D), the Behavior Modification treatment groups (B/E), and the control groups (C/F).

	A/D	B/E	A/D	C/F	B/E	C/F
N	21	21	21	21	21	21
Mean	32.83	36.12	32.83	30.98	36.12	30.98
Mean Diff.	3.29		1.85		5.14	
σ	11.55	14.90	11.55	13.23	14.90	13.23
$\sigma_{M_1-M_2}$	13.33		12.42		14.14	
t	.80		.48		1.18	

Table XXIV

Trend analysis results of repeated tests of groups A (Doman-Delacato), B (Behavior Modification), and C (control) on the Doman-Delacato Profile.

Source	df	SS	MS	F
Treatment	2	1,149.32753	574.6638	.60
Error (treat)	29	27,682.27091	954.56	
Trials	4	227.34375	56.8359	30.04*
Treatment x Trials	8	8.49534	1.0619	.56
Error (trials)	116	219.46091	1.8919	
Total	160	29,286.89844		

the treatment groups is presented in Figure 9. The only significance noted on the trend analysis is among the trials, which means that there is a significant increase in the means of the combined three treatment groups over the ten weeks of treatment and testing. The non-significant interaction between trials and treatment indicates a lack of other than chance differences among the slopes of the testing means. Although all three curves are essentially linear and increase monotonically over the testing period, the between treatment means for the various testing periods remains relatively unaltered. The apparent positive relationship of initial score and gain on the modified Lincoln-Oseretsky Motor Development Scale (discussed earlier) is less apparent for the Doman-Delacato Profile scores, although again there is a prevalence of low gains in all treatment groups for subjects initially receiving the lowest Doman-Delacato Profile scores; the average gain for the nine lowest scores on the Doman-Delacato Profile was 1.2 as contrasted with an average gain of 4.2 for subjects initially scoring higher than 23. This is illustrated in Figure 10.

The Relationship Between the Doman-Delacato Profile and the Modified Lincoln-Oseretsky Motor Development Scale.

The foregoing analyses involving the modified Lincoln-Oseretsky Motor Development Scale and those involving the Doman-Delacato Profile scores, though generally similar, differ in a single and important instance, namely the significantly greater Lincoln-Oseretsky test scores for the behavior modification group when compared to the control group. This significance was revealed both by the _t_ value of 2.37 for

Figure 9

Profile of mean scores achieved by groups A (Doman-Delacato), B (Behavior Modification), and C (Control) on the Doman-Delacato Profile.

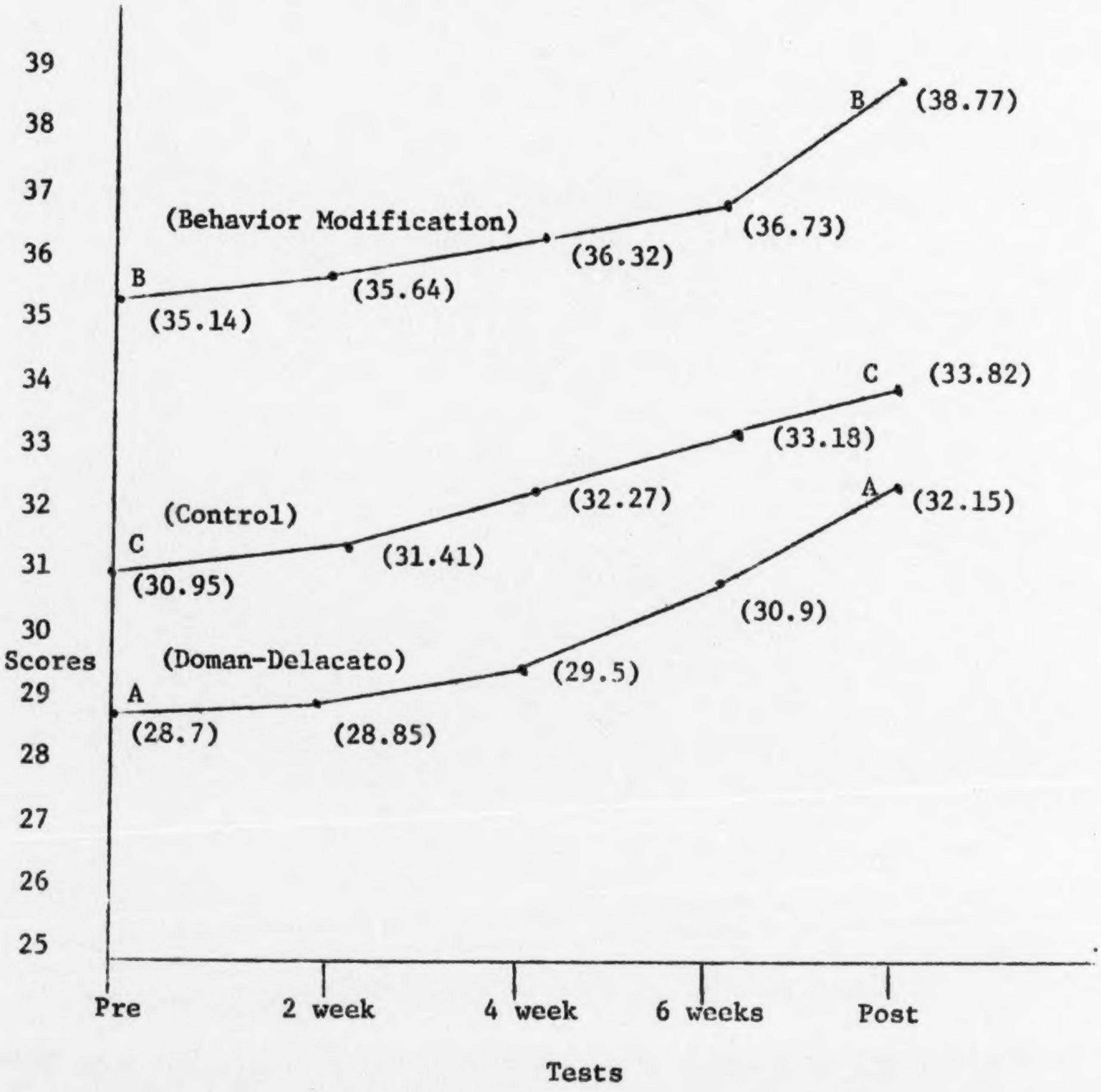
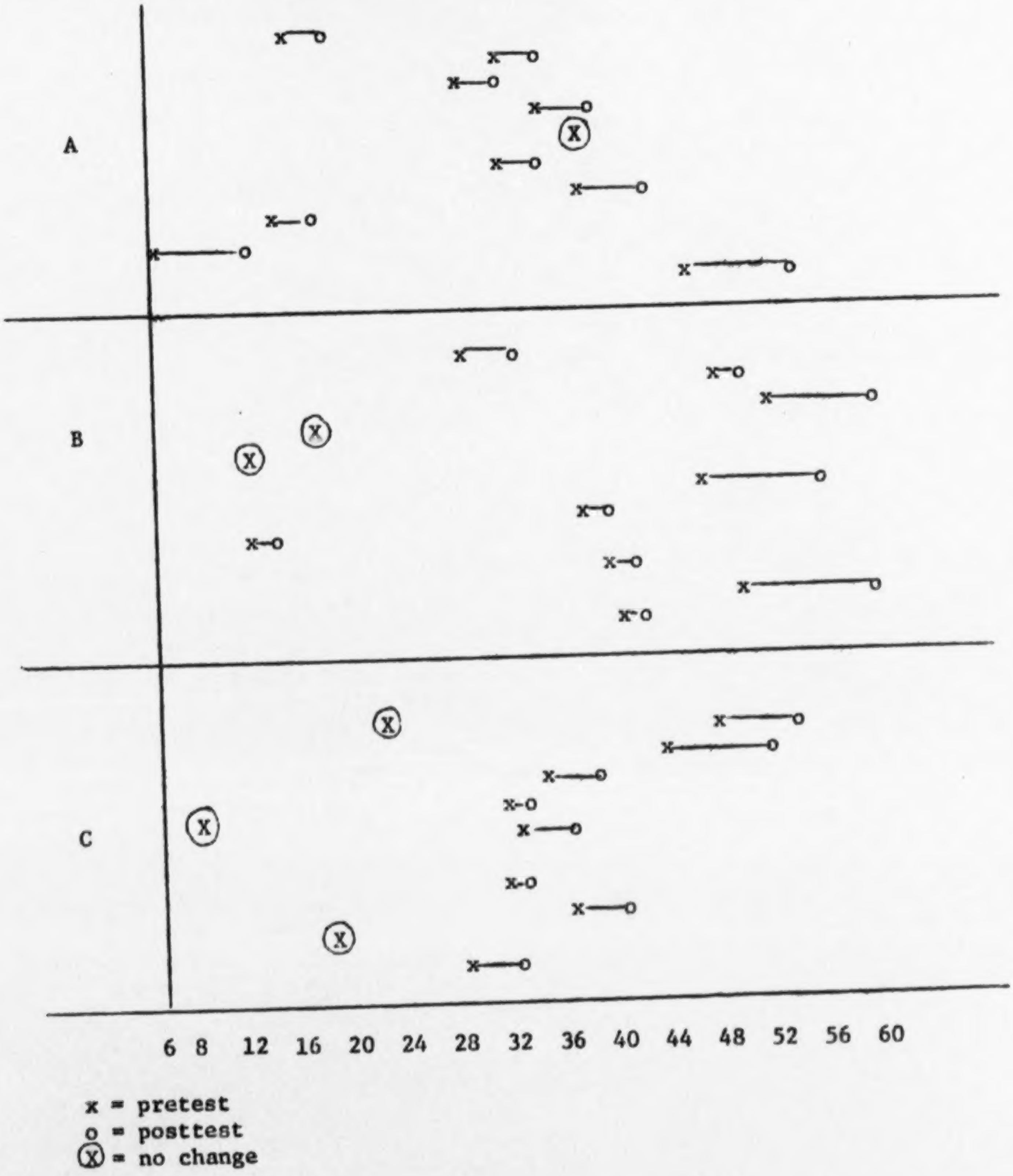


Figure 10

Gain scores of groups A (Doman-Delacato), B (Behavior Modification), and C (Control) on the Doman-Delacato Profile.



the posttest mean comparison and by the non-parallel curves for the test period means.

The relatively high Pearson Product Moment correlation coefficients computed between the modified Lincoln-Oseretsky Motor Development Scale and the Doman-Delacato Profile scores (.77 for the 32 subjects receiving the pretests and .71 for the 32 subjects receiving only posttests) suggests that these two measures generally order subjects similarly. That this similarity obtains despite apparent gross differences in item composition and test administration was somewhat surprising.

Conclusions

Both the Doman-Delacato Profile and the modified Lincoln-Oseretsky Motor Development Scale revealed no differences between the groups who were periodically tested and those groups which received posttesting only. Therefore, the null hypothesis which indicated that there would be no differences in mean motor coordination posttest scores between these two sets of groups is accepted.

The major hypothesis involving a comparison of the posttest scores among the three treatment groups revealed a significant difference at the .05 level between the mean posttest modified Lincoln-Oseretsky Motor Development Scale scores favoring the behavior modification group over the control group.

The Lincoln-Oseretsky Motor Development Scale scores for the

Doman-Delacato treatment group were not significantly different than those for the control group. Comparisons of the scores between the Doman-Delacato and behavior modification groups similarly failed to achieve significance.

Although the modified Lincoln-Oseretsky Motor Development Scale was not designed to provide a breakdown of gross and fine motor coordination scores, expert advice was obtained to determine which items measured which type of coordination. An examination of the differences achieved in these two types of coordination was undertaken. t-tests achieved the same results as were attained for the overall scores, indicating a significant difference (.05 level) between the behavior modification group and the control group in treatment effects for both gross and fine motor coordination. A conclusion is reached that the behavior modification treatment method produced not only significant improvement in motor coordination, but that these effects were manifested in both gross and fine motor coordination improvement.

Twelve children had received zero scores on the modified Lincoln-Oseretsky Motor Development Scale. Recomputations for the post score analyses excluding the zero scores resulted in an identical pattern of significant and non-significant t's as those attained with the zero scores included. There was a significant difference at the .05 level between the post scores achieved by those receiving the behavior modification method of treatment and those receiving no treatment. No other significant differences were noted. The Doman-Delacato Profile indicated no significant differences among any of the treatment groups.

However, the same general ordering of scores was noted in the Doman-Delacato Profile as was achieved in the modified Lincoln-Oseretsky Motor Development Scale, that is, that the behavior modification groups achieved higher mean post scores than did the Doman-Delacato group and the control group.

There were no significant differences between the follow-up testing and the posttesting scores on either the Doman-Delacato Profile or the modified Lincoln-Oseretsky Motor Development Scale. Gains made during the study and the significant differences (.05 level) achieved between the behavior modification group and the control group were maintained during the follow-up testing. Decidedly the improvements or lack of improvement achieved during the treatment period were stable.

The trend analysis of both the Doman-Delacato Profile scores and the modified Lincoln-Oseretsky Motor Development Scale for groups A, B and C indicated significant increases in mean test scores over the ten week test-treatment period. Significant differences (.01 level) in interaction between treatment and trial were further obtained on the modified Lincoln-Oseretsky Motor Development Scale indicating differences in the slope test means between the three treatments. Although all curves were essentially linear and monotonically increasing over the ten week period, the greatest increase was that for the modified Lincoln-Oseretsky means for the behavior modification group.

Pearson-Product Moment correlations were computed between scores achieved on the Doman-Delacato Profile and the modified Lincoln-Oseretsky Motor Development Scale. The correlation between the two sets of pretest scores of groups A, B and C combined was .77. The correlation between two sets of posttest scores for the remaining groups D, E, and F combined was .71. The high degree of correspondence between scores from the two scales was somewhat higher than expected considering that they were administered by different examiners and are composed of items of an essentially different nature.

CHAPTER V

SUMMARY AND IMPLICATIONS

Summary

This study examined the effects of two treatment methods on coordination of mongoloid children. One of the treatments was the Doman-Delacato method; the other treatment used behavior modification procedures. The mongoloid children were sorted by age and by sex and then randomly assigned to one of six groups. The groups received treatment as follows: Group A received the Doman-Delacato treatment, was pretested and tested every two weeks during training. Group B received the behavior modification program, was pretested and tested every two weeks during training. Group C received no treatment but was tested in accordance with the same schedules as groups A and B. Group D received the Doman-Delacato treatment and received no testing until the completion of the training. Group E received the behavior modification program and received no testing until the completion of the training. Group F received no treatment and was tested in accordance with the same schedule as Groups D and E.

The entire mongoloid population between the ages of 7 to 12 who were not ill or infirm and who were not committed to other studies in Fairview Hospital and Training Center was utilized in the study. These 72 children were randomly assigned, twelve to each of the six groups.

During the course of the study eight subjects were necessarily dropped either because of missing too many treatments or because of unavailability for testing.

The children receiving the Doman-Delacato treatment were patterned four times a day for five minutes each time with at least a fifteen minute interval between each patterning session. In addition these children were required to crawl through a crawl box and to crawl around the floor.

The children receiving the behavior modification treatment method received this treatment for the same time period as those receiving the Doman-Delacato treatment, that is, four daily five-minute sessions with at least a fifteen minute interval between each five minute session. Each five minute session engaged the child in a different activity. These activities were built on the principles of shaping, operant discrimination, and a chaining of responses. In all cases only social reinforcement was utilized; this entailed verbal approval and physical contact. The activities afforded to the children under behavior modification may be summarized as string winding, placing pegs in holes, placing discs in slots, cutting, jumping, board walking, pencil mazes, and pencil coordination. Each of the activities was broken down into a series of steps. The children were taught these steps in reverse sequence and were reinforced on a continuous reinforcement schedule at the conclusion of the final step.

All treatments were administered by students from Oregon College of Education. Eighty students were so involved and participated in a one day training session. During the course of the study supervision was maintained in which their procedures were corrected if necessary.

Two evaluation instruments were used, the Doman-Delacato Profile and a modified version of the Lincoln-Oseretsky Motor Development Scale. The Doman-Delacato Profile was administered to groups A, B, and C as a pretest measure, a bi-weekly test measure, and for all groups as a posttest and follow-up measure. The Profile was administered by the Executive Director of the Institutes for the Achievement of Human Potential in Oregon who was unaware of which child was receiving which treatment.

The Lincoln-Oseretsky Motor Development Scale was administered to the same groups on the same schedule as the Doman-Delacato Profile. It was administered by a psychometrist from Teaching Research Division of the Oregon State System of Higher Education who also was unaware of which children were receiving which treatment.

It was found necessary to modify the Lincoln-Oseretsky Motor Development Scale since many of the severely retarded subjects in this study were unable to achieve scores on the scale. The floor of the scale was therefore lowered based on pilot testing of 14 children. All but twelve of the 72 main study children achieved better than zero scores on the modified scale.

Results were analyzed using each scale score separately. The correlation between the scales was also computed. t-tests of the posttest mean scores of the modified Lincoln-Oseretsky Motor Development Scale revealed the behavior modification treatment group scoring significantly higher than the control group at the .05 level. Differences between the Doman-Delacato treatment groups and the control groups were not significant nor were differences between the Doman-Delacato and behavior modification treatment groups. Intergroup differences were also examined for gross and fine motor coordination subscores derived from the total scale scores. A similar pattern of significance and nonsignificance was found for these subscores, _t_-tests revealing a significant difference for the post mean scores only between the behavior modification group and the control group at the .05 level for both gross and fine coordination.

_t_-tests were computed for the post mean scores of the Doman-Delacato Profile. No significant differences were noted.

A follow-up using both scales was administered three months after the conclusion of the posttest to all children who were posttested, excepting one child who had died. No significant differences were noted between the follow-up test scores and the posttest scores obtained three months earlier. The same pattern of significant differences obtained during posttesting maintained for the follow-up scores, strongly supporting the argument for the stability of the gains made during the treatment periods.

Trend analysis of the scores achieved by groups A, B and C indicate significant (.01) increases in the means over time over testing trials. A significant (.01) interaction between trials and treatments on the modified Lincoln-Oseretsky Motor Development Scale indicated that the curves as plotted by the mean scores on this scale did not have the same slope for the three treatments.

Pearson-Product Moment correlations were computed between scores achieved on the modified Lincoln-Oseretsky Motor Development Scale and the Doman-Delacato Profile. The correlations between the two sets of pretest scores of Groups A, B and C combined was .77 and between the posttest scores of the remaining groups D, E, and F was .71. The high degree of correlation between the scores of the two tests was somewhat surprising since they were administered by different examiners and are essentially quite different in their nature.

Implications

The negative conclusions which can be drawn about the effectiveness of the Doman-Delacato treatment as a result of this study must be considered in terms of certain built in limitations of the study. First, the population utilized was mongoloid. The Institutes for the Achievement of Human Potential in Philadelphia and in Oregon maintain they "are uncertain about the effectiveness of their treatment on a mongoloid population" although they both treat cases which are mongoloid and do maintain that with many of these improvement is achieved.

A second limitation is the time factor, namely, that the study ended after only nine weeks of treatment. The Doman-Delacato theory suggests as much as three months may be necessary for indications of success. Although the Doman-Delacato treatment groups did achieve higher (non-significant) scores in both the Doman-Delacato Profile and the modified Lincoln-Oseretsky Motor Development Scale than those received by the control group, the slopes of mean scores for these two groups were essentially parallel suggesting continued lack of treatment differentiation. To resolve this question, a longer treatment program would be necessary.

Perhaps the most important consideration here is that an alternative procedure (the behavior modification treatment method) devised as a "contrast" treatment by the investigator achieved greater motor development gains in the same study period.

It should be noted that any argument for additional time logically may be applied to the superior behavior modification groups as well. On the basis of the present data it must be concluded that the behavior modification technique was the most successful treatment (of those examined) for improving coordination in a mongoloid population. Further improved motor coordination training procedures involving behavior modification techniques and principles is certainly recommended and may certainly have long range implications for vocational and adjustment opportunities.

It should also be pointed out that the behavior modification methods utilized in this study employed only social reinforcements which has repeatedly been demonstreated to be the least powerful reinforcement for this age group and type of retardate. One expansion here would be to use other than this simple reinforcement method.

This study has demonstrated that a systematic program could achieve results in improving coordination. It should be pointed out that the students who were administering the behavior modification treatment were trained in a minimum amount of time, and although they received much supervision, it was generally agreed that their training could have been more intense in that they should have received a practice session with prospective patients in addition to the one day lecture instruction administered prior to the commencement of the program. The fact that success was achieved without the practicum is also indicative that behavior modification might be used in a limited program of this nature by adults with minimum training who could apply this training successfully to a retarded group. This may well have some very important implications for the training of parents and their utilization of behavior modification techniques with their children.

The study's utilization of the Lincoln-Oseretsky Motor Development Scale demonstrates that this scale needs to be modified to be used effectively with a population of this nature. The modifications which were made for this particular study should have value for other researchers desiring a scale to measure motor coordination of the more severely retarded.

A matter of concern to the investigator evolving from this study is the problem of measurement of motor development in young severely handicapped children. There is need for good rapport between the psychometrist and the children being tested. There is also need for a broader sampling of motor behavior in at least two senses - over time and over testing situations and in the variety of tasks measured. The modified Lincoln-Oseretsky Motor Development Scale developed satisfies the variety of tasks aspect of this problem.

This study has not solved the controversy relative to the effectiveness of the Doman-Delacato treatment method nor did it ever intend to do so. No one study will be able to do that. However, the study demonstrates that within the time frame available, five days a week, nine weeks, and 20 minutes treatment each day, the behavior modification technique was the more efficient method of improving motor coordination for institutionalized mongoloid children. The Doman-Delacato method failed to yield improvement significantly greater than a "no treatment" control group. What needs to be further determined is what would happen if the study were carried out beyond the nine week period. Conceivably, the Doman-Delacato treatment might have a more demonstrable effect given a longer treatment period. The alternative, however, is also possible. Similarly the effect of more extensive behavior modification treatments remains to be demonstrated. The shapes of the learning curve for both treatment groups at the conclusion of the study afford only minimal clues here.

APPENDIX A

STUDENT RECORD FOLDER INFORMATION

Child Training Record
(Cross out when complete)

1. String Winding
2. Pegs and Holes
3. Discs
4. Board Walking
5. Jumping
6. Cutting
7. Mazes
8. Pencils

String Winding										
1. Last 1/2 peg 4										
Peg 4										
Last 1/2 peg 3										
Peg 3										
Last 1/2 peg 2										
Peg 2										
Last 1/2 peg 1										
Peg 1										
Pick String up										
2. Last 1/2 peg 4										
Peg 4										
Last 1/2 peg 3										
Peg 3										
Last 1/2 peg 2										
Peg 2										
Last 1/2 peg 1										
Peg 1										
Pick String up										
3. Last 1/2 peg 4										
Peg 4										
Last 1/2 peg 3										
Peg 3										
Last 1/2 peg 2										
Peg 2										
Last 1/2 peg 1										
Peg 1										
Pick String up										
4. Last 1/2 peg 4										
Peg 4										
Last 1/2 peg 3										
Peg 3										
Last 1/2 peg 2										
Peg 2										
Last 1/2 peg 1										
Peg 1										
Pick String up										

Pegs & Holes										
1. Peg into hole										
Pick up peg-hole										
Pick up 4 pegs-hole										
2. Peg into hole										
Pick up peg-hole										
Pick up all pegs-hole										
3. Peg into hole										
Pick up peg-hole										
Pick up all pegs-hole										
4. Peg into hole										
Pick up peg-hole										
Pick up all pegs-hole										

Discs										
1. Disc into hole										
Pick up disc-hole										
Pick up all discs-hole										
2. Disc into hole										
Pick up disc-hole										
Pick up all discs-hole										
3. Disc into hole										
Pick up disc-hole										
Pick up all discs-hole										

Board Walking										
Balances on board, steps off										
One step										
Two steps										
Three steps										
Four steps										
Five steps										
Six steps										
Seven steps										
Eight steps										
Nine steps										
Ten steps										
Gets on board unaided										

Cutting										
1. One cut										
Two cuts										
Three cuts										
One side										
Second side less one										
Second side										
Third side										
Pick up scissors all										
2. One cut										
Two cuts one side										
One side										
One cut, 2 sides										
Two cuts, 2 sides										
Two sides										
One cut, 3 sides										
Two cuts, 3 sides										
3 sides										
One cut from edge										
Start from edge										
Pick up scissors										
3. One cut										
One side										
One cut										
Two sides										
One cut										
Three sides										
One cut										
Four sides										
Pick up scissors										
4. One side										
Two sides										
Three sides										
Four sides										
Five sides										
Six sides										
Seven sides										
Eight sides										
Pick up scissors										

Mazes										
Point B to A										
Point C to A										
Point D to A										
Point E to A										
Point F to A										
Point G to A										
Point H to A										
Point I to A										
Point J to A										

Pencils										
Diverging										
Converging										
Clockwise Squares										
Opposite Squares										
Counterclockwise hexagons										
Opposite hexagons										

APPENDIX B

MEMORANDUM:

TO: OCE students participating in the Fairview Project

FROM: Bud Fredericks

RE: Additional Behavior Modification Activity - MAZES

Mazes

For those patients who are on mazes the procedure should be as follows:

Have the child first draw a line from point B to point A. When you are satisfied that the child can successfully draw the line from point B to point A without going outside the parallel lines, you may then have him proceed to draw a line from point C to point A. When you are satisfied that he can complete that, have him draw a line from point D to point A and so on until the child is capable of drawing a line from point J to point A. Notice that point A is the end point, not the beginning. The object is to have the child end at point A each time. Each time he does this, you should reinforce his behavior. If you reach a point at which the child is unable to stay within the lines, have him practice those that he is able to do and then gradually move into the section that he is unable to accomplish. But always have him complete the line down to point A.

APPENDIX C

MEMORANDUM:

TO: All OCE students participating in Fairview project

FROM: Bud Fredericks

RE: New Behavior Modification Activity - PENCILS

The patient uses 2 pencils, one in the left and one in the right hand. The exercises to be done are as follows:

1. Diverging pencils.

Start from common point at center of the page and have the patient draw 2 lines simultaneously to points at the side of the paper. For example, patient would draw lines from point A to points B & C simultaneously. (Student should use blank paper and draw small circles at points B and C).

o o
C B
o
A

2. Converging pencils.

Start from 2 points at edge of paper and draw to common point in the center. For instance, in diagram above, patient would start at points B & C and draw simultaneously to point A. (Student should use blank paper and draw small circle at A).

3. Clockwise Squares.

Patient draws 2 squares simultaneously, moving both pencils clockwise.

4. Opposite squares.

Patient draws 2 squares simultaneously, moving one pencil clockwise and the other counterclockwise.

5. Counterclockwise hexagons.

Patient draws 2 hexagons (⬡⬡) simultaneously, moving both pencils counterclockwise.

6. Opposite hexagons.

Patient draws 2 hexagons (⬡⬡) simultaneously, moving one pencil clockwise and the other counterclockwise.

APPENDIX D

Teaching Research Modification
of the
LINCOLN-OSERETSKY MOTOR DEVELOPMENT SCALE
for
Trainable Retarded

Teaching Research Division
Oregon State System of Higher Education
Monmouth, Oregon

ADMINISTRATION AND SCORING

A. General Instructions

Throughout this scale the symbol "S" means subject and "E" means examiner. Standing on "tiptoe" should not be taken literally anywhere in the test, but should signify standing on the balls of the feet or simply that the heels are raised.

B. Directions

Since this scale is primarily one of motor proficiency and not of general intelligence, every caution should be taken to make sure the subject comprehends each task (test item) he is expected to do. While it probably is impossible to eliminate the factor of verbal comprehension, every effort should be made to minimize this intellectual function as a variable in the overall test performance. Anything that can be done to assist the subject in understanding the task is permissible. In all cases it is desirable for E to demonstrate the required performance. S may be encouraged while he is performing a task provided this encouragement does not interfere with the performance. There may be times when the subject's first attempt is not correct because of obvious lack of understanding. In such cases the item is repeated without penalizing the subject's score. For example, in Item K-1, THROWING A BALL, S is required to throw a ball from the shoulder without raising or lowering his arm (as in a shot put). If S throws the ball in an overhand or underhand fashion, he should be corrected by E and advised further as to the "proper" way of doing the task.

Although some attempt has been made to provide a set of instructional and administrative standards, the examiner is allowed considerable freedom and judgment in giving instructions. Under such conditions empirical data should be presented regarding the effect of variation in examiner procedures upon scores. Such data are not available and the effects of such variation are unknown.

C. Fatigue

In a test of this nature fatigue is an important consideration. Every attempt should be made to minimize its influence. Adequate rest periods between trials should be allowed and whenever the subject shows signs of becoming fatigued additional rest should be given. Fatigue, of course, will vary considerably for different subjects. Some will seem to become more stimulated as the test goes on and show even less signs of fatigue. Unfortunately, only subjective estimation of this factor is available at present. The examiner should recognize this and modify the speed of testing accordingly.

D. Materials and Testing Facilities

It is desirable to have a relatively spacious room. The room should be free from extraneous objects such as book cases, lamps, rugs, etc. A wooden floor which is not highly polished or a linoleum floor is most desirable. A marble floor seems less desirable. While it is difficult to control the type of shoes the subject is wearing, whenever possible, it would be best for him to have rubber heels; and certainly metal "taps" should be avoided. The subject should not be tested in his stocking feet. A good sized table and two straight-backed chairs will be needed. Two of the items require the subject to make dots on paper. With these items the examiner may use tacks or scotch tape to hold the paper in place.

Test materials are listed below. After each item the test number in which the item is used is given.

1. Record Blank - See Annex A
2. Two plastic or wooden boxes. Inside dimensions 4" x 4" x 2" high - F-2 and F-3.
3. One plastic or wooden box. Inside dimensions 4" x 4" x 5" high - F-1.
4. Thread on wooden spool. Thread is No. 20 and should be unwound 78". Spool cylinder (on which thread is wound) is 2 3/8" in circumference by 1 1/8" long. Circumference of outer rim of spool is 5". Overall length of spool is 2 3/8". G-1 & G-2.
5. Twenty matchsticks 2" long with no more tha 1/8" variation from this length. Ordinary "kitchen size" matches with heads removed - F-1 and F-2.
6. Wooden target and ball. Target 10" square. Any thickness. Attached to string for hanging on nail. Regulation tennis ball - J-1,2,3,4 and K-1.
7. Rope. Household clothesline 6' long - E-4.
8. White paper with four sets of two parallel lines each 1/2" between lines, 1" between sets. Size of sheet may vary from 8" x 10" to 8 1/2" x 11" - H-2.
9. Mazes and pencils - See Annex B - H-3.
10. Concentric circles - See Annex C - I-1.

11. Blunt pointed scissors - I-1.

12. Two pencils and plain white paper. Pencils should not have fine points. Number 2 pencils about 5" long are satisfactory H-1.

13. Wooden rod. Pine wood (or similar weight) 18" long by 1/2" square. Ends should have flat surface - L-1 and L-2.

14. Ten pennies - F-3.

15. Four thumbtacks. (for holding up target in K, holding down paper in H-1,2,3)

16. Tape measure. (for measuring distances and marking lines)

17. 6 1' x 1' rubber or sponge mats with 4" diameter painted circle on center of each - A-1 and A-2.

18. Chalk, tape, or paint. (for marking lines)

A-1 Walking Forward on a Straight Line of Mats

Equipment: Six 1 foot square rubber or sponge mats with 4" diameter circles painted in the center of each.

Number of Trials: Two (if necessary)

Directions: The mats should be placed in a straight line six inches apart. E should demonstrate the proper procedure of stepping in the center of each mat with first one foot and then the other foot until all six have been stepped upon. E may have to place S's feet on each mat to give S the idea. E should state that S is not to "go off" the mats during the trial. S is allowed one practice trip after E is convinced the S understands.

Scoring Criteria: The test is passed if S is able to step inside each mat in one trip without missing all or part of any mat.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

A-2 Walking Forward on Staggered Mats

Equipment: Six 1 foot square rubber or sponge mats with 4" diameter circles painted in the center of each.

Number of trials: Two (if necessary)

Directions: The mats should be placed staggered so that the "upper" right hand corner of one mat touches the lower left hand corner of the second mat and the upper left hand corner of the second mat touches the lower right hand corner of the third mat and so on for a total of six mats. E should demonstrate the proper procedure of stepping in the center of each mat making certain that S understand that he is not to "go off" the mats. S is allowed one practice trip after E is convinced S understands.

Scoring Criteria: The test is passed if S is able to step inside each mat in one trip without missing all or part of any mat.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

A-3 Walking Along a Line Heel to Toe

Equipment: Straight line on floor 6' long, two inches wide, in chalk, paint, or tape placed on a smooth floor free from any obstacles.

Number of trials: Two (if necessary)

Directions: S is to walk along the line placing heel to toe as he steps, E should make certain that S understands that he is to touch heel to toe each time and that he should keep both feet on the line at all times.

Scoring Criteria: S is scored positive if he is able to walk the length of the line as directed, keeping both feet on it for the entire length and consistently touching the heel of the forward foot to the toe of the other on each step taken.

Points: + on 1st trial = 3
- on 1st trial + on 2nd trial = 2
- on both trials = 0

A-4 Walking Forward on a 6' Diameter Semi-Circle
a. Counter-clockwise
b. Clockwise

Equipment: A 6' diameter semi-circle, one inch wide, in chalk, paint, or tape placed on a smooth floor free from any obstacles.

Number of trials: Two (if necessary)

Directions: S is to walk normally along the line placing each foot on the line. E should demonstrate the proper procedure and allow S one practice trip after E is convinced S understands.

Scoring Criteria: Missing the line one time with either foot constitutes a failure of the trial.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

A-5 Walking Backwards

Equipment: None

Number of trials: Two (if necessary)

Directions: S is to walk backwards 6'. His arms should hang naturally by his side. Say, "I want you to walk like this". E demonstrates, placing one foot directly behind the other, heel to toe, and walking 6'. E says, "Remember your toe must touch your heel, each step you take." It is advisable for E to mark the two yard distance on the floor.

Scoring Criteria: S must not deviate more than one foot in either direction laterally. If S fails to touch heel to toe, E corrects S on first trial only. S should not have to use his arms in order to maintain balance.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

B-1 Standing on Tiptoe

Equipment: None

Number of trials: Two (if necessary)

Directions: Stand on toes in an upright position, feet together, hands on hips, eyes open.

Scoring Criteria: S is scored positive if he stands on toes as described for five seconds without shifting feet, without hopping, and without touching heels to floor.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

B-2 Standing on Tiptoe with Eyes Closed

Equipment: None

Number of trials: Two (if necessary)

Directions: Stand on toes in an upright position, feet together, hands on hips, eyes closed.

Scoring Criteria: Score positive if S remains standing on toes for five seconds without shifting feet, hopping, touching heels to floor, or opening eyes.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

B-3 Standing Heel to Toe With Eyes Open

Equipment: None

Number of Trials: Two (if necessary)

Directions: Stand in an upright position, hands on hips, eyes open, with one foot placed directly in front of the other so that the heel of the forward foot touches the toe of the other.

Scoring Criteria: Score positive if S stands heel to toe as directed for 5 seconds without removing hands from hips, or breaking heel-toe contact between feet.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

B-4 Standing Heel to Toe with Eyes Closed

Equipment: None

Number of trials: Two (if necessary)

Directions: Stand in an upright position, hands on hips, eyes closed, with one foot placed directly in front of the other so that the heel of the forward foot touches the toe of the other.

Scoring Criteria: Score positive if S stands heel to toe as directed for five seconds without removing hands from hips, opening eyes, or breaking heel-toe contact between feet.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

B-5 Standing on One Foot with Eyes Open

Equipment: None

Number of trials: Two (if necessary) for each foot

Directions: Stand with full weight of body on one foot only, hands on hips, eyes open. Then repeat using other foot.

Scoring Criteria: Score positive if S is able to stand on one foot as directed for five seconds without touching other foot to floor, without removing hands from hips, and without hopping.

Points: + on 1st trial = 3
- on 1st trial + on 2nd trial = 2
- on both trials = 0

B-6 Standing on One Foot with Eyes Closed

Equipment: None

Number of trials: Two (if necessary) for each foot.

Directions: Stand with full weight of body on one foot only, hands on hips, eyes closed. Then repeat using other foot.

Scoring Criteria: S is to be scored positive if he is able to stand on one foot as described for five seconds without touching other foot to floor, without removing hands from hips, without hopping, and without opening eyes.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

C-1 Jump on Toes Rapidly

Equipment: None

Number of trials: Two (if necessary)

Directions: Jump up and down rapidly on toes with feet together within a twelve inch square.

Scoring Criteria: Score positive if S jumps with feet together up and down on toes and only toes for five times in five seconds.

Points: + on 1st trial = 3
- on 1st trial + on 2nd trial = 2
- on both trials = 0

C-2 Crouching on Tiptoes

Equipment: None

Number of trials: Two (if necessary)

Directions: S is to stand on tiptoe in a semicrouched position with knees flexed approximately 45 degrees, and arms extended horizontally at the sides. Feet are parallel and approximately one foot apart. Say: "How steady are you? Let's see if you can balance on your tiptoes with your arms out like this. (E demonstrates) Remember, you must stay on your toes with your knees bent and keep your arms out straight. Ready, Go!"

Scoring Criteria: The position must be maintained for five seconds on each trial. A trial is failed if S falls, puts weight on heels, touches floor with hands, or steps out of place. The arms should be maintained in an essentially straight horizontal position, but moving other parts of the body to maintain balance is permitted.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

D-1 Touching Nose

Equipment: None

Number of trials: One

Directions: S is to stretch both arms out to the sides horizontally with index fingers extended and then touch his nose with each hand alternately three times. Eyes are kept open, and the head is kept still. E demonstrates saying: "Stretch your arms out like this. Now touch your nose with your right hand, keeping your head still. That's fine. Now touch it with your left hand." S should touch his nose three times with each hand, alternately.

Scoring Criteria: A trial consists of three attempts to touch the nose with the index finger with each hand. The trial is considered passed if each hand touches the nose twice in the three attempts.

Points: + on 1st trial = 3
- on 1st trial = 0

D-2 Touching Fingertips

Equipment: None

Number of trials: Two (if necessary) for each hand.

Directions: S is to touch all the fingertips of one hand in succession with the thumb of the same hand beginning with the little finger. The test is then repeated in reverse order, starting with the index finger. Say: "Let me see you touch your fingertips with your thumb. (E demonstrates) Start with your little finger and touch each finger in order like this. Then go back again to the little finger this way. You do it. That's fine. Now let's try it with your other hand."

Scoring Criteria: A trial consists of S touching each finger successively and repeating the test in reverse order. There is a five second time limit for each trial. A trial is failed if S touches a finger more than once, touches two fingers at the same time with the thumb, or if he skips one or more fingers. The test is passed if one of two trials is successful for each hand. If a second trial is necessary the test should be repeated on the same hand before the other hand is tested.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

D-3 Close and Open Hands Alternately

Equipment: None

Number of trials: Three (if necessary)

Directions: S is to extend his arms full length in front of him, with the palms of the hands turned down. S is to close his right hand making a fist and at a given signal, he must open it and close the left one, continuing in this manner as fast as possible. Say: "Stretch your arms out full length like this (E demonstrates) in front of you with your palms turned down. First I want you to close your right hand like this and keep it closed until I say "go". When I say "go" you are to open your right hand and close your left hand. You are to repeat this order (E demonstrates) like this until I say "stop". Ready, Go!"

D-3 continued

Scoring Criteria: Time limit is 10 seconds. A trial is passed if S makes no unnatural facial movements, if S does not open and shut his hands at the same time, and/or if he does not bend one or both of his elbows.

Points: + on 1st trial = 3
- on 1st trial + on 2nd trial = 2
- on 1st and 2nd trials, + on 3rd trial = 1
- on all three trials = 0

D-4 Tapping Rhythmically with Feet and Fingers

Equipment: None

Number of trials: Two (if necessary)

Directions: While seated, S is to tap the floor rhythmically with the soles of the feet, performing the movement alternately with each foot at any speed he elects. At the same time, the corresponding index fingers are to tap the table top which is placed in front of S. The finger and foot tapping should be synchronous. Say: "Let's see if you can do these two things at the same time. Make a fist with this finger (index) stretched out like this. Next tap the floor with your right foot and tap the table at the same time with your right finger. Let's see if you can remember. You use first one hand and foot and then the other hand and foot. (E demonstrates several times to show a rhythm) Keep tapping until I say "stop".

Scoring Criteria: The trial is passed if the rhythmic tapping is maintained for at least 15 seconds. The trial is failed if the rhythm of the movement is changed, or if the tapping does not correspond to that of the same foot.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

E-1, 2, 3

1. Stepping Over a Knee-High Obstacle
2. Ducking Under a Shoulder-High Obstacle
3. Passing Between an Obstacle and a Wall

Equipment: A broom handle or similar object which is approximately three feet in length.

Number of trials: Two per task (if necessary)

Directions: Stand close to a wall so that one end of the broom handle can be placed against the flat vertical surface. Hold one end of the handle firmly and place the other end against the wall so that the handle extends parallel to the floor. Task 1: Place the broom handle about level with the child's knee height, the child facing the stick in position for stepping over it. Say: "Step over the stick." Task 2: Place the broom handle about two inches below the child's shoulder height. Say: "Duck under the stick." Task 3: Pull the end of the broom handle away from the wall just far enough so the child can get between the end of it and the wall if he turns his body sidewise. Say: "Go between the wall and the stick without touching either." E may demonstrate each task if S is uncertain and/or non-verbal.

Scoring Criteria: S passes each task if the obstacle is not touched by any part of the body during the exercise.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both trials = 0

E-4 Jumping Over a Rope

a. Ankle Height
b. Between Ankle and Knee
c. Knee Height

Equipment: A rope six feet long

Number of trials: Two per height (if necessary)

Directions: The rope should be stretched between two chairs so that the center is even with the ankles, between the ankles and knees, or even with the knees. One end of the rope should be tied with a very loose loop to prevent the Subject's tripping. S should jump with both feet together and the knees should flex at the same time as in a standing broad jump. S should jump without the feet touching the rope. E demonstrates saying: "Let's see if you can jump over the rope like this. Now try it."

E-4 continued

Scoring Criteria: The test is passed if S completes each jump keeping feet together without touching the rope.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on both = 0

F-1 Placing Matchsticks in a Box

Equipment: 4" x 4" x 5" box, 10 matchsticks

Number of trials: One trial with each hand

Directions: Place one row of 10 matchsticks approximately one fourth inch apart parallel to the box. The box should be within easy reach of S who is seated at the table so that he can touch the matches with the arm half flexed. Say: "Let's see you put these matchsticks into the box as fast as you can. Use only one hand and put in only one matchstick at a time, like this. (E demonstrates with several matchsticks) Place the matchsticks, do not throw them into the box." E records time to complete the trial. The test is repeated with S using his other hand.

Scoring Criteria: The score depends upon the time to complete the task. Maximum time for a trial is 60 seconds. Five seconds are added to the time score for each error committed. The throwing of matches into the box, or picking up more than one match at a time constitutes errors.

Points: 0 - 20 seconds = 3
21 - 40 seconds = 2
41 - 60 seconds = 1

F-2 Placing Matchsticks in a Box

Equipment: One 4" x 4" x 2" box and 20 matchsticks

Number of trials: One

Directions: S is seated at the table. The box is placed on the table parallel with the edge and within easy reach of S's half flexed arm. Ten matchsticks are placed on each side of the box and parallel to it. The sticks should be placed parallel to each other about one-half inch apart. The stick adjacent to the box on each side should be about one inch from the box. E demonstrates, saying: "Watch what I do. See, I take a match in each hand and place them both in the box at the same time. Now you try to put them in the box as quickly as possible. Start with the sticks nearest to the box and remember that you should take two sticks, one in each hand, and put them both in the box at the same time. Ready, go!" E records time to complete task.

Scoring Criteria: The score depends upon the time to complete the task. Maximum time for a trial is 60 seconds. Five seconds are added to the time score for each error committed. The throwing of matches into the box, or picking up more than one match at a time constitutes errors.

Points: 0 - 20 = 3
21 - 40 = 2
41 - 60 seconds = 1

F-3 Placing Coins and Matchsticks in Boxes

Equipment: Two 4" x 4" x 2" boxes, 10 matchsticks, 10 pennies

Number of trials: One

Directions: The two boxes are placed two inches apart on the table in front of the subject within easy reach of each arm. To the subject's right of the right hand box, 10 pennies are placed in a row, to the left of the left hand box, 10 matchsticks are placed in a row. S is to place the pennies in the right hand box and the matches in the left hand box using both hands simultaneously. The matches and pennies must be placed, not thrown into the box. Say: "I want to see how quickly you can do this stunt. When I say go, you are to take the matches in your left hand, one at a time, and put them into the box on your left. At the same time, you are to take pennies one at a time, with your right hand and place them in the box on your right. You must do both things at the same time. Do you understand? (E

F-3 continued

demonstrates, placing two or three coins and sticks into the boxes simultaneously, and then returning these pieces to the rows before beginning the test.) Ready, go!" E records time to complete the task.

Scoring Criteria: The score depends upon the time to complete the task. Five seconds are added to the time score for each error committed. Each time S does not place the pieces into the boxes simultaneously, throws the pieces into the boxes, or picks up more than one piece at a time, he is to be corrected verbally by E and five seconds are added to his time score.

Points: 0 - 30 seconds = 3
31 - 50 seconds = 2
51 - 70 seconds = 1

G-1 Winding Thread

Equipment: A spool of thread

Number of Trials: One trial with each hand

Directions: The thread should be allowed to unwind to a distance of six-and-one-half feet and should be fastened securely on one end of the spool. The thread should be unwound when given to S. S should take the thread between the thumb and index finger of the preferred hand and the spool in the other hand. Say: "Let's see how fast you can wind this thread onto the spool. Ready, go!" S should be cautioned against excessively moving the hand holding the spool. After the trial with the preferred hand, the task is repeated with the other hand. Say: "Now do the same thing with the other hand.

Scoring Criteria: E notes the exact time S takes to wind the thread. The maximum time limit for a trial is 60 seconds. The test is passed for a hand if the thread is completely wound on the spool within the time limits given below.

Points: 0 - 20 seconds = 3
21 - 40 seconds = 2
41 - 60 seconds = 1

G-2 Winding Thread While Walking

Equipment: Spool of thread

Number of trials: One trial with each hand

Directions: S is to wind a six-and-one-half foot thread around his index finger as quickly as he can while walking. E demonstrates, saying: "I want you to walk about the room holding the thread in one hand and winding the thread onto your finger while walking." S is given the spool of thread already unwound with the spool attached and dangling at the end. Say: "Wind as fast as you can and don't stop walking while you are winding. Ready, go!" E records time. After the trial with the preferred hand, the test is repeated with S using the other hand.

Scoring criteria: The test is scored according to the time limits given below. If the rhythm of synchronous walking and winding is broken more than three times, during the trial, that trial is scored as a complete failure. The E should warn S of the errors he is making up to a maximum of three warnings without penalty.

Points: 75 and over = 3
51 - 74 = 2
21 - 50 = 1
20 or less = 0

H-1 Tapping

Equipment: Four sheets of plain paper approximately 8 1/2 by 11 inches. Lead pencils, with blunt tips.

Number of trials: Two trials each hand

Directions: S is seated at a table on which there is a sheet of plain paper. He rests his right forearm on the table, and takes the blunt pencil in his hand. At a given signal, he is to tap the paper with the pencil as quickly as he can, but is to avoid hitting in the same spot more than once. The dots may be made anywhere on the paper. Only the hand may be moved. Cross movements of the arm are not permissible. Say: "I want to see how many dots you can make on this paper with this pencil. You may move your hand, but you may not move your arm from the table. Be careful not to tap twice in the same spot. Ready, go!" Two trials are given consecutively with a fresh piece of paper being substituted by E on the second trial. After a minutes rest, E provides another sheet of paper, and says: "Now, let's try it with your other hand. Ready, go!"

H-1 continued

Scoring criteria: Time limit for each trial is 15 seconds. The score for each hand is the mean number of dots made on the two trials.

Points: 75 and over = 3
51 - 74 = 2
21 - 50 = 1
20 or less = 0

H-2 Drawing Lines

Equipment: Pencil, a sheet of plain white paper 8 1/2 by 11 inches with four pairs of horizontal lines drawn one-half inch apart.

Number of trials: Two trials with each hand

Directions: S should be seated at a table with his forearm resting on the table and holding the pencil as in a writing position. Say: "When I say "go" I want you to draw as many lines as you can between these two lines (indicate)." E demonstrates, drawing about five perpendicular lines between two or the horizontal lines ruled on the paper. I want your lines to touch these two lines but not to run over. Do you understand? Ready, go!" E records time.

Scoring criteria: Time limit, 30 seconds both hands. The score is the number of lines correctly drawn during the time limit. A line is not counted if it overruns or is short of the horizontal lines on the paper by more than 1/8th of an inch. The distance between the perpendicular lines which S draws is unimportant. Two successive trials are given for each hand. The score for each hand is the mean number of correct lines for the two trials.

Points: 10 and over = 3
5 - 9 = 2
1 - 4 = 1

H-3 Tracing Mazes

Equipment: Pencil and mazes

Number of trials: One trial with each hand

Directions: S is seated at the table and is to trace the maze with a pencil. The entries to the maze are in the lower right hand corner and the finish points are in the upper left. S should start with the lower maze. Say: "This is a passageway (E indicates by pointing) and these are fences which are charged with electricity. I want you to draw a line showing me how you can get to the finish line over here (E points) and go through it and come out here without bumping against the fence. Remember as soon as you have finished with this passageway go on to the next. Ready, go!" E records time time for completion of the task. After a 30-second rest the test is repeated on a new sheet with S using his other hand. Say: "Now go through the passageways with your left hand. Remember go on to the second passageway as soon as you have finished the first. Don't bump the fence." If S turns the paper, E cautions him not to.

Scoring criteria: The score for each trial depends upon the amount of time S takes to complete the two mazes on a sheet. Five seconds are added to the time score for each error. Going outside the boundary line constitutes an error but touching the boundary line is not an error.

Points: 0 - 35 seconds = 3
36 - 50 seconds = 2
over 50 seconds = 1

I-1 Cutting a Circle

Equipment: Paper with three printed concentric circles with 3/4", 1 1/4", and 1 3/4" radii. Middle circle (1 1/4" radius) should be darker and wider than other circles. Scissors with blunt tips.

Number of trials: One trial with each hand

Directions: S is to cut a circle into and along the heaviest middle line taking care not to get off the line. Say: "Here is a picture of some circles. See if you can cut along the darkest middle line with these scissors. (E demonstrates) Try to stay on the middle line as you cut, so when you have finished you will have a nice, round circle." E records time for completion of the task. After a 30-second rest, the test is repeated with the other

I-1 continued

hand. Say: "Now let's try cutting with your other hand. Remember you are to cut along the middle line."

Scoring Criteria: The score depends upon the time to complete cutting the circle for each hand. Five seconds are added for each error. An error is counted each time S cuts across one of the other black lines. After each error E should remind S he is to cut along the middle line.

Points: 0 - 59 seconds = 3
60 - 119 seconds = 2
119 - over = 1

J-1 Catch Tossed Ball with Two Hands

Equipment: Regulation tennis ball

Number of trials: Five

Directions: E should toss the ball to S with an underhand motion so that when the ball reaches S it is describing a downward curve and S is able to catch the ball in his cupped hands with the palms facing downward. The ball should be "lobbed" over and not thrown in a straight line. If E makes a bad toss the trial is not counted. S stands at a distance of 6 feet from E, the palms of his hands against his thighs. E precedes each toss with the warning statement: "Here it comes." Up to five tosses are made with S using both hands to catch the ball.

Scoring Criteria: The number of times the ball is caught is recorded for each hand. If S makes four successful catches in a row it is not necessary to make the fifth throw.

Points: 4 or 5 successes = 3
2 or 3 successes = 2
1 success = 1
0 success = 0

J-2 Bounce Ball and Catch with One Hand

Equipment: Regulation tennis ball

Number of trials: Five with each hand

Directions: S should bounce the ball once with one hand and catch it with the same hand. One bounce and catch or attempted catch constitutes one trial. Five trials constitute the test for one hand. Following completion of the test for one hand, the test is then repeated with S using the opposite hand.

Scoring Criteria: The score is positive if S is able to throw the ball against the floor and catch it on one bounce with one hand as directed without the aid of the other hand or any other part of the body. The number of times the ball is caught is recorded for each hand. If S makes four successful catches in a row it is not necessary to make the fifth attempt. In the event S uses the wrong hand in catching the ball, E corrects him but does not count the trial.

Points: 4 or 5 successes = 3
2 or 3 successes = 2
1 success = 1
0 success = 0

J-3 Bounce Ball with One Hand Five Times

Equipment: Regulation tennis ball

Number of trials: Three (if necessary)

Directions: S should keep both feet stationary and bounce ball with one hand five times without catching.

Scoring Criteria: The score is positive if S is able to bounce the ball as described at least five times in succession. S may pivot but must not move both feet completely out of position in order to achieve a positive score.

Points: + on 1st trial = 3
- on 1st trial + on 2nd = 2
- on 1st and 2nd trial + on 3rd = 1
- on all three trials = 0

J-4 Catch Tossed Ball with One Hand

Equipment: Regulation tennis ball

Number of trials: Five with each hand

Directions: E should toss the ball to S with an underhand motion so that when the ball reaches S it is describing a downward curve and S is able to catch the ball in his cupped hand with the palm facing upward. The ball should be "lobbed" over and not thrown in a straight line. E is to toss the ball toward the hand that S is to use in making the catch. If E makes a bad toss, the trial is not counted. S stands at a distance of 6 feet from E, the palms of his hands against his thighs. E precedes each toss with the warning statement: "Here it comes." Up to five tosses are made with S using one hand to catch the ball. After 10 seconds rest, the test is repeated with S using the other hand. Say: "Let's see how well you can catch a ball in one hand. Stand here (E designates a point 6 feet distant) and keep your hands at your sides like this (E demonstrates) until I toss the ball. Catch the ball in one hand. Are you ready? Here it comes." After five throws the test is repeated with S using his other hand.

Scoring Criteria: The number of times the ball is caught is recorded for each hand. If S makes four successful catches in a row it is not necessary to make the fifth throw. In the event S uses the wrong hand in catching the ball, E corrects him but does not count the trial.

Points: 4 successes = 3
2 or 3 successes = 2
1 success = 1
0 success = 0

K-1 Throwing a Ball

Equipment: Target 10 inches square; regulation tennis ball

Number of trials: Five trials with each hand

Directions: The target is placed on the wall at a distance of six feet from front foot of S and at the height of subject's chest. The ball should be held in the hand close to the shoulder and must be thrown in a straight line (as in a shot put) without raising the arm and must not be tossed or thrown overhand or underhand. The opposite foot should be set forward. Say: "Let's see if you can hit the bull's eye. See if you can hit the target with this ball, throwing it this way." (E demonstrates) Five successive

K-1 continued

tosses are allowed with one hand and then the test is repeated with S using his other hand.

Scoring Criteria: The score is the number of times the target is hit out of five trials for each hand. If S makes an incorrect throw such as throwing the ball overhand or underhand, E corrects him but does not count that trial.

Points: Each hand is scored separately as follows:
4 hits = 3
2 or 3 hits = 2
1 hit = 1
0 hits = 0

L-1 Balancing a Rod Crosswise on the Index Finger

Equipment: 18 inch rod

Number of trials: Three trials (if necessary) with each hand

Directions: S is seated and is to balance the rod horizontally on the index finger. The hand is closed in a fist with the exception of the extended index finger, and held in a sideways position such that the little finger is down and the index finger up so that the knuckles are in a vertical axis. E demonstrates saying: "See if you can balance this stick on your finger the same way I am doing until I tell you to stop." E hands rod to S and tells him to go ahead. S is permitted to use his other hand in the initial balancing. E starts timing as soon as S has the stick correctly balanced on his finger. The item is repeated with S using the other hand.

Scoring Criteria: The item is passed if S balances the rod on his finger for at least five seconds. The item is failed if the rod falls off or if S uses his other hand to keep the rod on his finger.

Points:
+ on 1st trial = 3
- on 1st trial + on 2nd = 2
- on 1st and 2nd trial + on 3rd = 1
- on all three trials = 0

L-2 Balancing a Rod Vertically on the Index Finger

Equipment: 18 inch rod

Number of trials: Three trials (if necessary) with each hand

Directions: S is seated. The hand is closed in a fist with the exception of the extended index finger. S is to balance the rod in a vertical position on the tip of the index finger, for a brief period. He is permitted to use his other hand in the initial balancing. Say: "Let's see if you can balance this rod on your finger, like this. (E demonstrates) Balance the stick until I say stop." If three trials are necessary they are given successively with the same hand. Allow 10 seconds between trials. The test is then repeated with S using his other hand. Say: "Now let's try to balance the rod with your other hand. Balance it until I say stop. Ready, go!"

Scoring Criteria: Rod must be balanced at least five seconds with the index finger. S is permitted to move arm or body but not to rise from the chair. The test is passed if any one of the three trials is correct.

Points: + on 1st trial = 3 — - on 1st & 2nd trials + on 3rd = 1
- on 1st trial + on 2nd = 2 — - on all three trials = 0

M-1 Imitations of Movements

Equipment: None

Number of trials: One

Directions: E faces the subject standing three to five feet away. Allow enough room so the subject can move his arms freely when they are fully extended. The task involves a seventeen step semaphore type system in which the child will imitate or mirror each move E makes with his arms. S is allowed to practice following E through the first five moves before beginning the trial. E says to S: "I am going to move my arms (demonstrating several positions) and I want you to move your arms just like I do. Are you ready?" E then moves through each move of the 17 positions in order, waiting for the child's response at each position.

Scoring Criteria: A trial consists of the S completing each movement with two or less subject corrected errors. A trial is failed if S makes a false move with one or both arms and does not make a correction in five seconds.

Points: + on first trial = 3; - on first trial + on 2nd = 2; - on both=0

ANNEX A

Teaching Research Modification of The Lincoln-Oseretsky Motor Development Scale

NAME ______________________ AGE __________________ SEX ________

EXAMINER ____________________ DATE ____________________

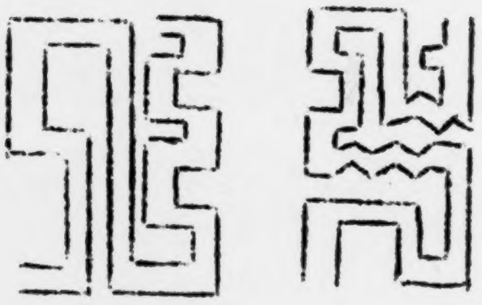
	Trials	Scoring	Points
A.			
1. Walking Forward on Straight Line of Mats	2	3-2-0	
2. Walking Forward on Staggered Mats	2	3-2-0	
3. Walking Along a Line Heel to Toe, 6 ft.	2	3-2-0	
4. Walking Forward on a 6' Diam. semi-circle C-Clockwise	2	3-2-0	
Walking Forward on a 6' Diam. semi-circle Clockwise	2	3-2-0	
5. Walking Backwards - Toe to Heel, 6 ft.	2	3-2-0	
B.			
1. Standing on Tiptoe, eyes open - 5 seconds	2	3-2-0	
2. Standing on Tiptoe, eyes closed - 5 seconds	2	3-2-0	
3. Standing Heel to Toe, eyes open - 5 seconds	2	3-2-0	
4. Standing Heel to Toe, eyes closed - 5 seconds	2	3-2-0	
5. Standing on one foot, eyes open - 5 seconds R. foot	2	3-2-0	
L. foot	2	3-2-0	

		Trials	Scoring	Points
6. Standing on one foot, eyes closed - 5 sec.	R. foot	2	3-2-0	
	L. foot	2	3-2-0	
C.				
1. Jump on Toes Rapidly - 5 in 5 sec.		2	3-2-0	
2. Crouching on Tiptoe - 5 sec.		2	3-2-0	
D.				
1. Touching Nose (3 times with each hand)		1	3-0	
2. Touching Fingertips	R. Hand	2	3-2-0	
	L. Hand	2	3-2-0	
3. Close and Open Hands Alternately 10 seconds		3	3-2-1	
4. Tapping Rhythmically with Feet & Fingers - 15 seconds		2	3-2-0	
E.				
1. Stepping Over a Knee-high Obstacle		2	3-2-0	
2. Ducking Under a Shoulder-high Obstacle		2	3-2-0	
3. Passing Between an Obstacle and a Wall		2	3-2-0	
4. a. Jumping a Rope, ankle height		2	3-2-0	
b. Jumping a Rope, between ankle and knee		2	3-2-0	
c. Jumping a Rope, knee height		2	3-2-0	
F.				
1. Placing 10 Matchsticks in a Box	R. Hand	________	seconds	
	L. Hand	________	seconds	

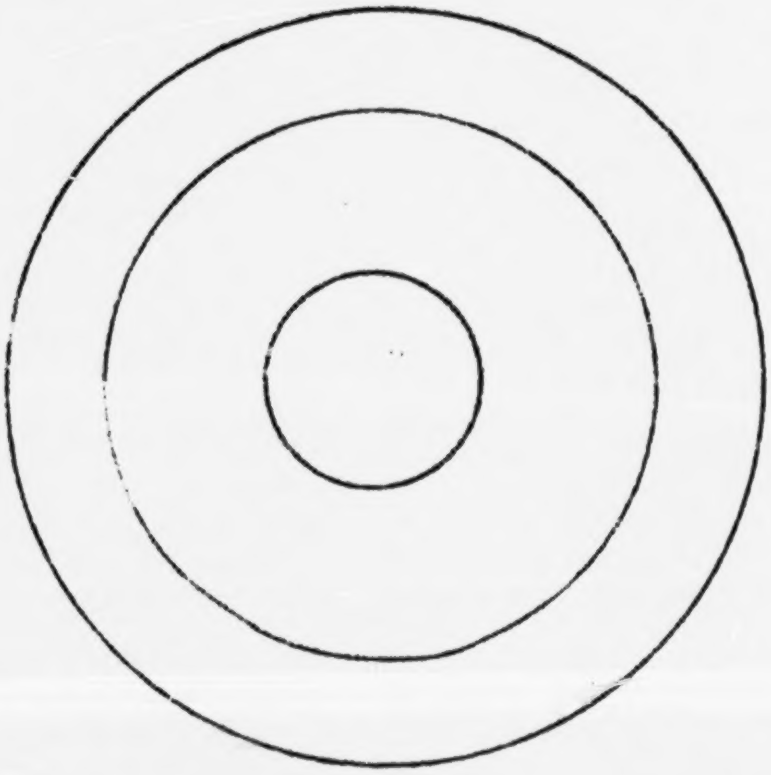
		Trials	Scoring	Points
2. Placing 20 Matchsticks in a Box		________	seconds	
3. Placing Coins & Matchsticks in Boxes		________	seconds	
G.				
1. Winding Thread	R. Hand	________	seconds	
	L. Hand	________	seconds	
2. Winding Thread on Finger While Walking	R. Hand	________	seconds	
	L. Hand	________	seconds	
H.				
1. Tapping	R. Hand	____	in 15 seconds	
	L. Hand	____	in 15 seconds	
2. Drawing Lines	R. Hand	____	in 30 seconds	
	L. Hand	____	in 30 seconds	
3. Tracing Mazes	R. Hand	________	seconds	
	L. Hand	________	seconds	
I.				
1. Cutting a Circle	R. Hand	________	seconds	
	L. Hand	________	seconds	
J.				
1. Catch Tossed Ball With Two Hands		5	4-5=3, 2-3=2 1=1	
2. Bounce Ball and Catch with 1 hand	R. Hand	5	4-5=3, 2-3=2 1=1	
	L. Hand	5	4-5=3, 2-3=2 1=1	
3. Bounce Ball with One Hand 5 times	R. Hand	3	3-2-1	
	L. Hand	3	3-2-1	

		Trials	Scoring	Points
4. Catch Tossed Ball with One Hand				
	R. Hand	5	4-5=3, 2-3=2 1=1	
	L. Hand	5	4-5=3, 2-3=2 1=1	
K.				
1. Throwing a Ball	R. Hand	5	4-5=3, 2-3=2 1=1	
	L. Hand	5	4-5=3, 2-3=2 1=1	
L.				
1. Balancing a Rod Horizontally, 5 seconds	R. Hand	3	3-2-1	
	L. Hand	3	3-2-1	
2. Balancing a Rod Vertically, 5 seconds	R. Hand	3	3-2-1	
	L. Hand	3	3-2-1	
M.				
1. Imitations of Movements		1	3-0	

ANNEX B



ANNEX C



Appendix E

Scores achieved on modified Lincoln-Oseretsky Motor Development Scale by groups A (Doman-Delacato), B (Behavior Modification), and C (Control) on pretests, periodic two week tests and posttests.

	Pre			2 week			4 week			6 week			Post		
Student	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
1	31	49	23	46	47	26	54	59	35	68	52	39	65	62	30
2	10	0	41	14	0	60	14	0	61	19	0	61	15	0	68
3	9	89	46	8	84	49	5	109	61	9	115	56	10	117	60
4	65	44	*	69	48	*	70	66	*	80	63	*	76	68	*
5	33	5	0	64	0	0	67	0	0	54	0	2	61	8	4
6	0	52	19	0	67	38	2	86	28	3	91	43	5	105	38
7	5	0	6	0	0	9	0	0	9	0	0	17	0	4	25
8	*	2	24	*	0	24	*	6	55	*	0	41	*	5	45
9	0	19	0	0	38	0	0	51	0	0	55	0	0	85	0
10	6	67	21	23	63	21	2	77	31	10	89	36	16	112	48
11	41	33	26	68	24	56	62	42	51	55	37	49	52	54	49
12	*	*	0	*	*	0	*	*	5	*	*	8	*	*	14

* deleted

Appendix F

Post scores and means achieved on the modified Lincoln-Oseretsky Motor development Scale by all groups.

Student	A	B	C	D	E	F
1	65	62	30	19	115	31
2	16	0	68	32	70	13
3	10	117	60	15	53	40
4	76	68	--	64	85	0
5	61	8	4	70	6	66
6	5	105	38	0	73	73
7	0	4	25	11	--	9
8	--	5	45	114	18	0
9	0	85	0	76	13	6
10	16	112	48	--	94	--
11	52	54	49	64	--	29
12	--	--	14	11	0	7
Mean	30.10	56.36	34.64	43.09	52.7	26.70

Appendix G

Results of follow-up testing on the modified Lincoln-Oseretsky Motor Development Scale.

Student	A		B		C		D		E		F	
	1	2	1	2	1	2	1	2	1	2	1	2
1	65	68	62	66	30	41	19	11	115	112	31	29
2	16	10	0	5	68	79	32	27	70	81	13	6
3	10	14	117	111	60	73	15	18	53	55	40	43
4	76	78	68	60	-	-	62	59	85	85	0	3
5	61	63	8	3	4	4	70	74	6	12	66	57
6	5	5	105	94	38	28	0	0	73	72	73	75
7	0	0	4	4	25	24	11	10	-	-	9	9
8	-	-	5	11	45	42	114	115	18	28	0	0
9	0	2	85	73	0	2	76	76	13	15	6	9
10	16	25	112	113	48	43	-	-	94	100	-	-
11	52	49	54	42	49	35	64	77	-	-	29	19
12	-	-	-	-	14	15	11	15	0	0	7	D
Mean	30.10	31.40	56.36	52.90	34.64	35.09	43.09	43.81	52.70	56.00	26.70	25.00

1 = Posttest 2 = Follow-up test D = Deceased

Appendix H

Post gross and fine motor coordination scores achieved on the modified Lincoln-Oseretsky Motor Development Scale.

Student	A		B		C		D		E		F	
	Gross	Fine	Gross	Fine	Gross	Fine	Gross	Fine	Gross	Fine	Gross	Fine
1	41	24	32	30	11	19	12	7	76	39	23	8
2	9	7	0	0	35	33	18	14	38	32	6	7
3	9	1	63	54	32	28	11	4	23	30	24	16
4	42	34	34	34	-	-	34	28	53	32	0	0
5	30	31	4	4	4	0	35	35	6	0	37	29
6	5	0	64	41	19	19	0	0	40	33	42	31
7	0	0	4	0	12	13	6	5	-	-	7	2
8	-	-	3	2	22	23	76	38	9	9	0	0
9	0	0	48	37	0	0	48	28	9	4	6	0
10	12	4	60	52	21	27	-	-	56	38	-	-
11	29	23	33	21	21	28	33	31	-	-	16	13
12	-	-	-	-	14	0	9	2	0	0	7	0

Appendix I

Scores achieved on Doman-Delacato Profile by groups A (Doman-Delacato), B (Behavior Modification) and C (Control) on pretests, periodic two week tests, and posttests.

	Pre			2 week			4 week			6 week			Post		
Student	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
1	35	52	35	36.5	54	35	38	54	35	38	56	38	39.5	60	39.5
2	32	12	48	32	12	48	32	12	52	35	12	52	35	12	54
3	15	48	44	15	48	48	15	50	50	17	50	50	18	56	52
4	46	48	*	46	48	*	48	48	*	54	48	*	54	50	*
5	38	13	18	38	15	18	33	15	18	41	15	18	42.5	15	18
6	6	39.5	33.5	6	39.5	33.5	6	39.5	35	6	42	35	10.5	42	36.5
7	38	17	23	38	17	23	38	17	23	38	17	23	38	17	23
8	*	38	29	*	38	29	*	38	29	*	38	33	*	39.5	33
9	16	40	9	16	40	9	16	42	9	16	42	9	17	42	9
10	29	50	32	29	50	32	29	52	33	29	52	33	32	60	33
11	32	29	37	32	30.5	38	35	32	38	35	32	41	35	33	41
12	*	*	32	*	*	32	*	*	33	*	*	33	*	*	33

* deleted

Appendix J

Scores and Means achieved on Doman-Delacato Profile by all groups on posttests.

Student	A	B	C	D	E	F
1	39.5	60	39.5	38	42	32
2	35	12	54	29	42.5	20
3	18	56	52	27.5	33.5	24
4	54	50	--	36.5	38	12
5	42.5	15	18	36.5	19.5	52
6	10.5	42	36.5	12.5	41	42.5
7	38	17	23	52	--	25
8	--	39.5	33	39.5	29	12.5
9	17	42	9	35	31	23
10	32	60	33	--	41	--
11	35	33	41	35	--	35
12	--	--	33	23	12	17
Mean	32.15	38.77	33.82	33.14	32.95	26.82

Appendix K

Results of follow-up testing on the Doman-Delacato Profile.

Student	A		B		C		D		E		F	
	1	2	1	2	1	2	1	2	1	2	1	2
1	39.5	40	60	60	39.5	39.5	38	40	42	42	32	32
2	35	35	12	12	54	54	29	29	42.5	42	20	20
2	18	18	56	60	52	52	27.5	27.5	33.5	33.5	24	24
4	54	54	50	50	-	-	36.5	36.5	38	38	12	12
5	42.5	43	15	15	18	18	36.5	36.5	19.5	19.5	52	52
6	10.5	10.5	42	42	36.5	36.5	12.5	12.5	41	41	42.5	44
7	38	38	17	17	23	23	52	52	-	-	25	25
8	-	-	39.5	39.5	33	33	39.5	40	29	29	12.5	12.5
9	17	17	42	41	9	9	35	35	31	31	23	23
10	32	32	60	60	33	33	-	-	41	41	-	-
11	35	35	33	33	41	41	35	35	-	-	35	35
12	-	-	-	-	33	32	23	23	12	12	17	D
Mean	32.15	32.25	38.77	39.05	33.82	33.73	33.14	33.36	32.95	32.90	26.82	27.95

1 = Posttest 2 = Follow-up test D = Deceased

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